

1006462 200202 25489001

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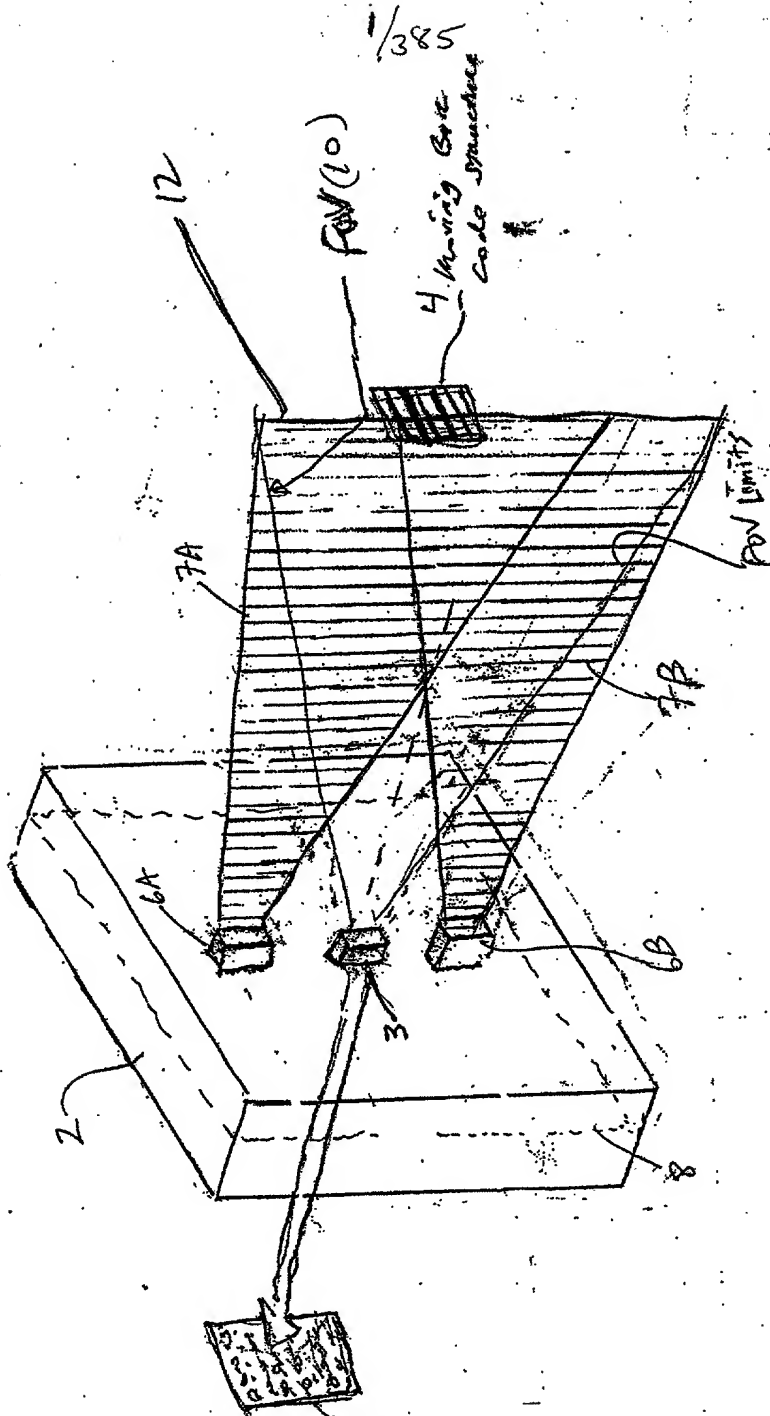
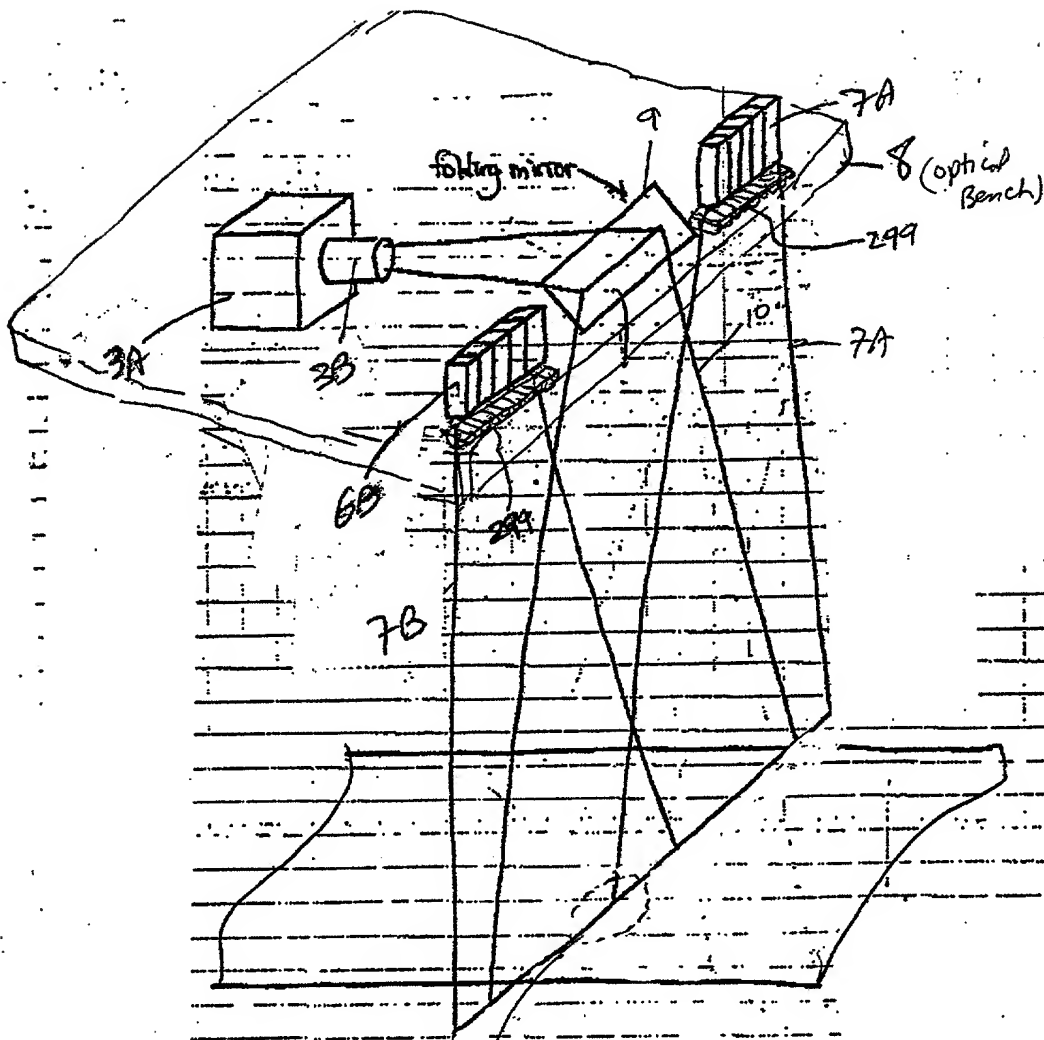


FIG. 1A

2/385



↑  
1A

FIG 1B1

Magnified field of view of  
CCD sensor element on  
object  
width of projected  
laser illumination  
beam on  
object

FIG 1B3

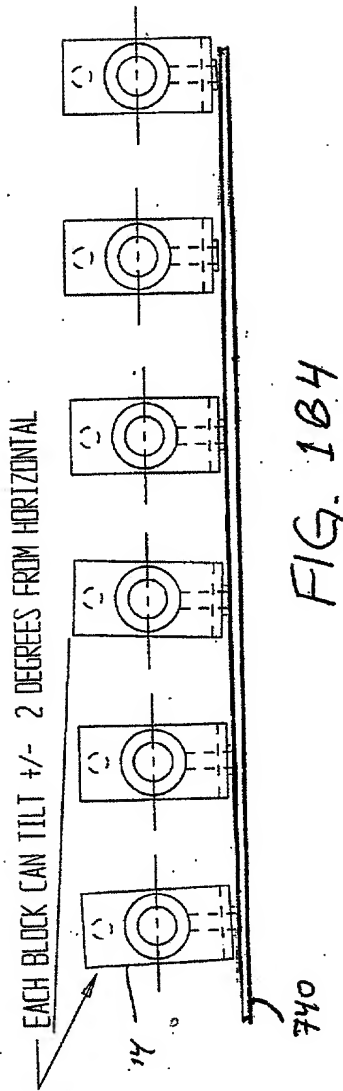
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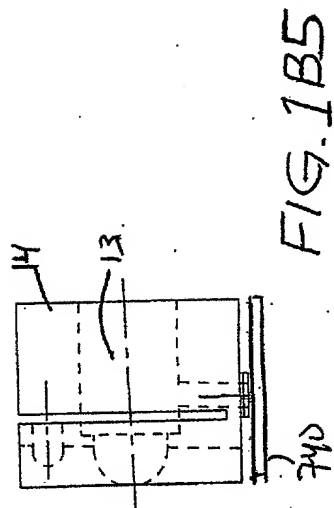


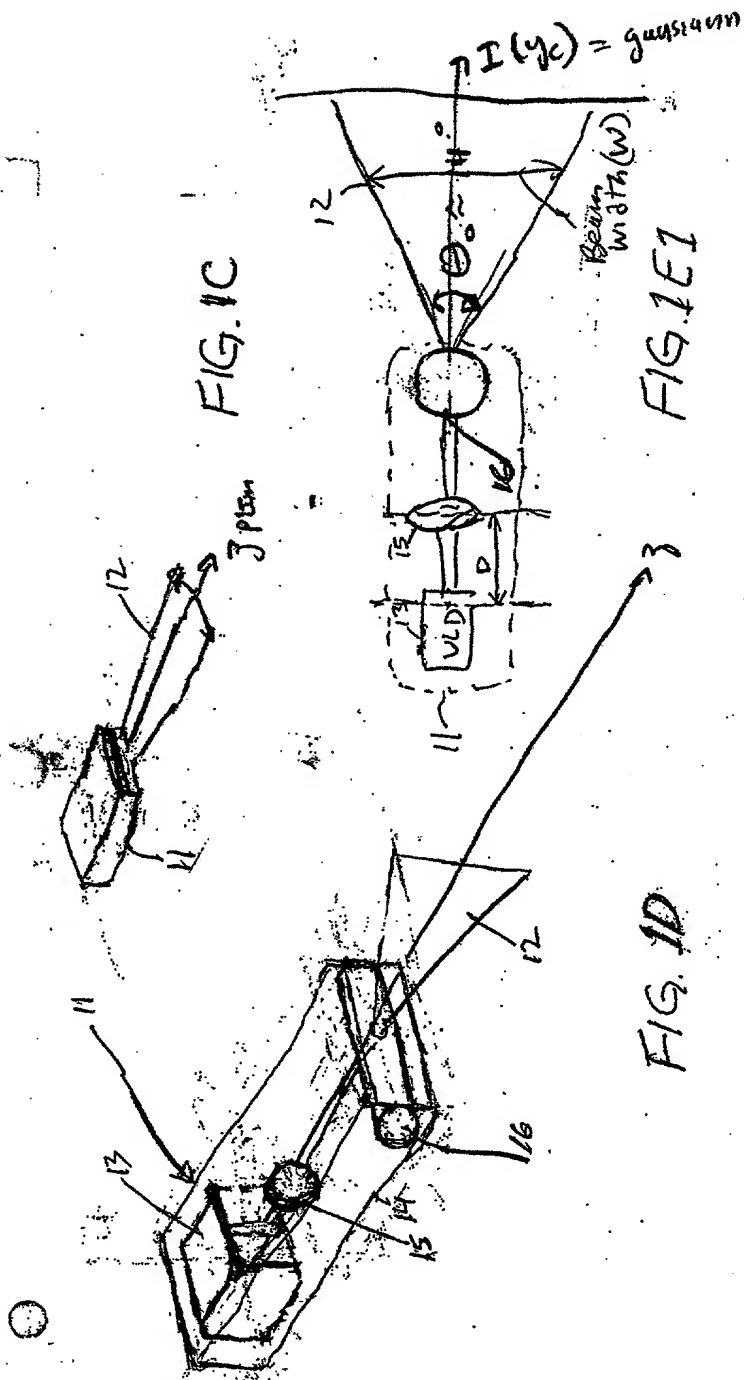
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4/385

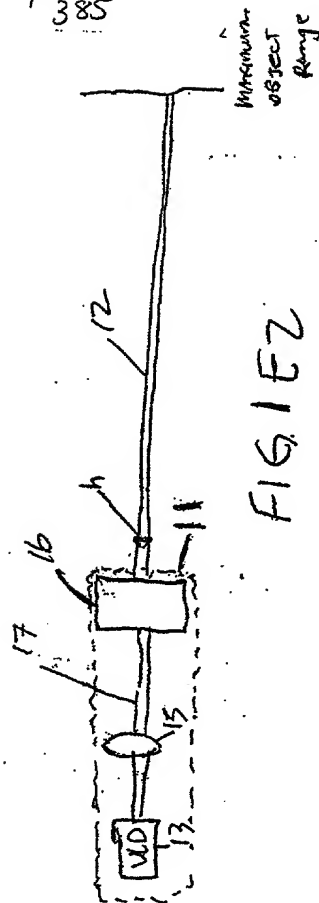


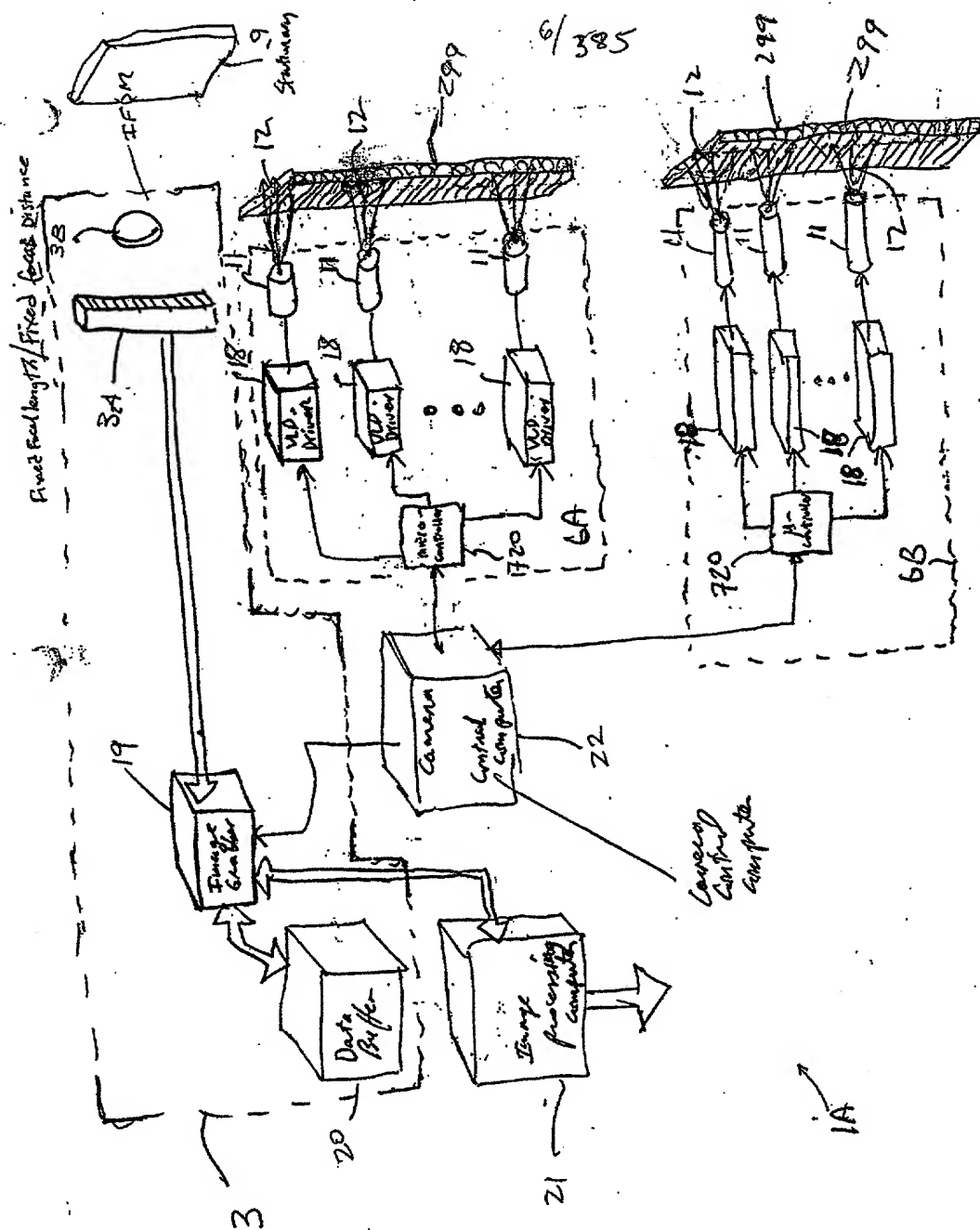
VLD BLOCK CAN PITCH FORWARD FOR ALIGNMENT WITH OTHER VLD BEAMS





5/385





7/385

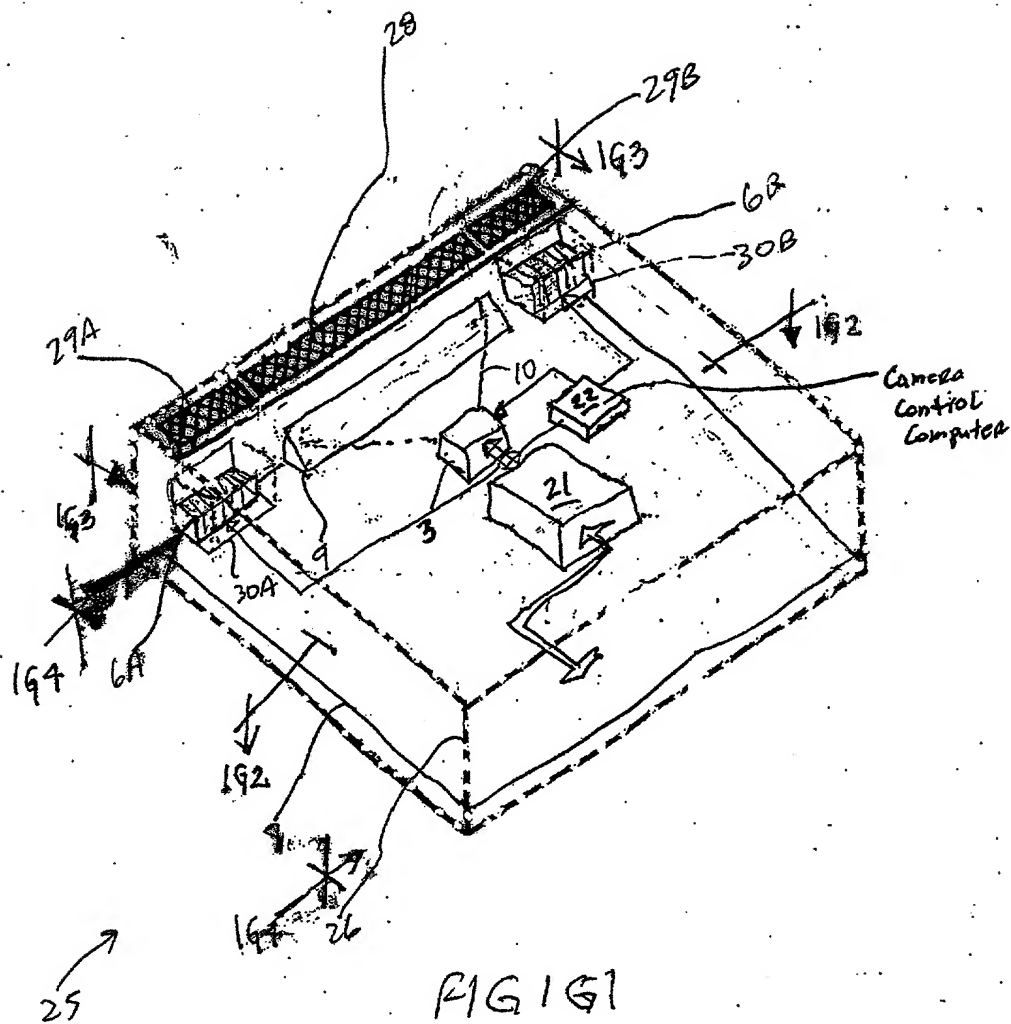


FIG 1G1

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8/ 385

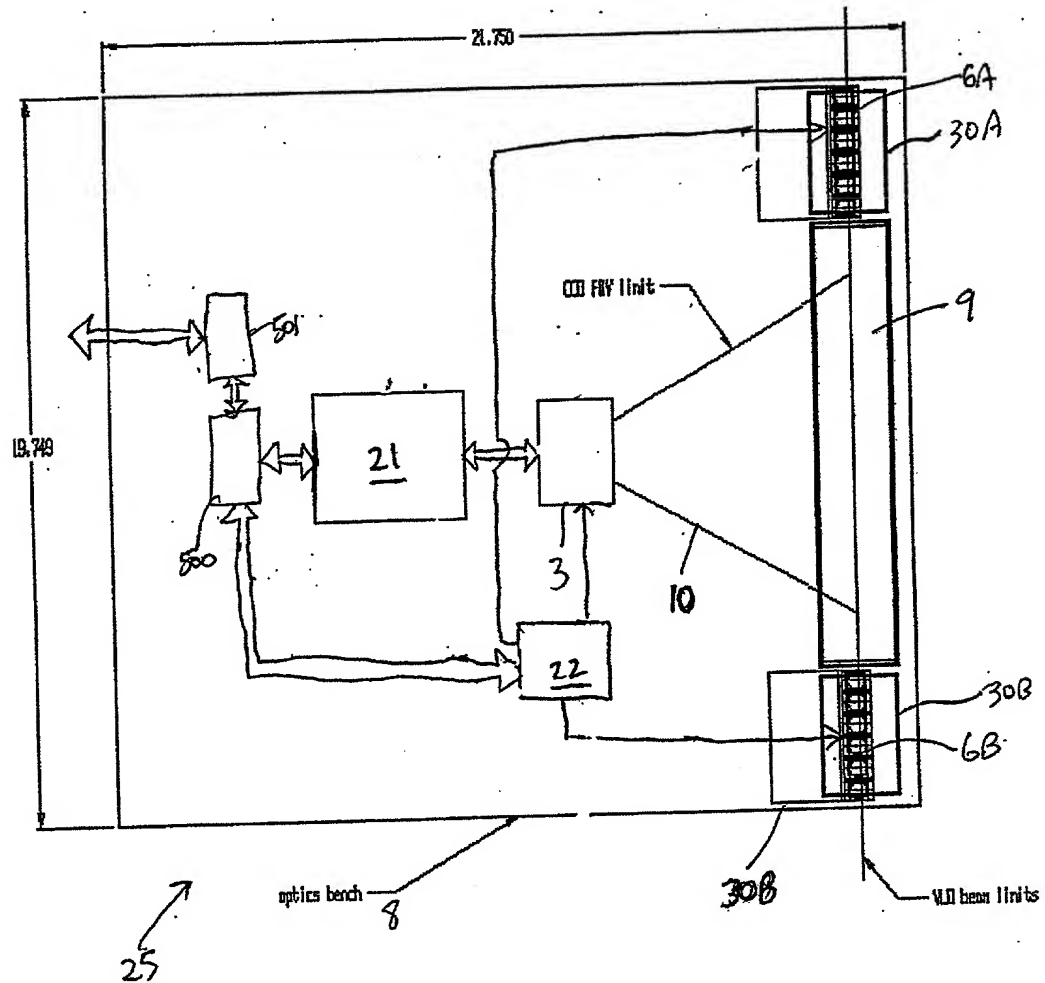
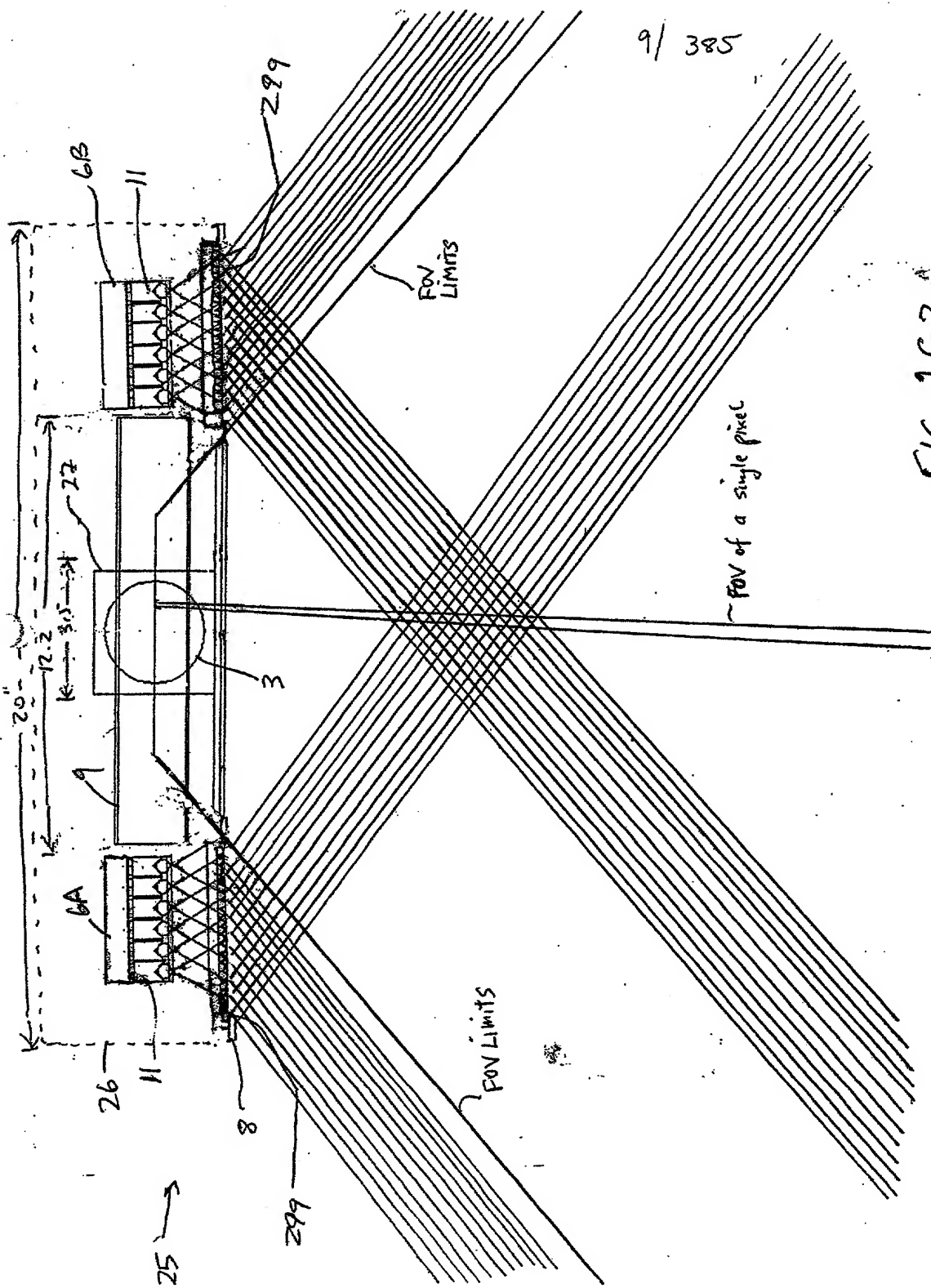


FIG. 162



10/385

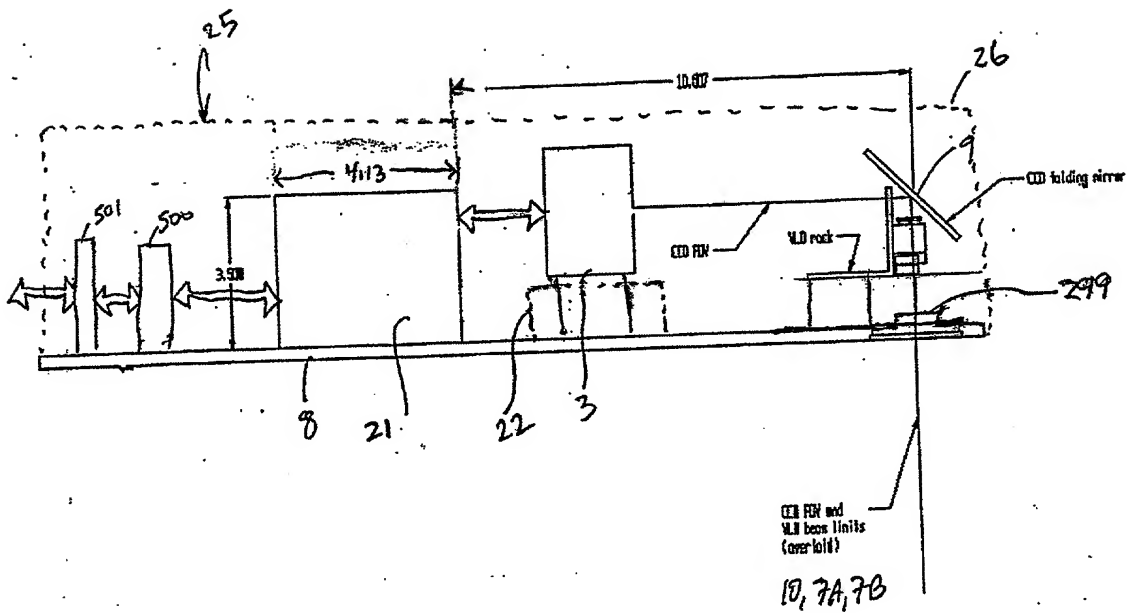


FIG. 164



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FIG. 1G5

12/385

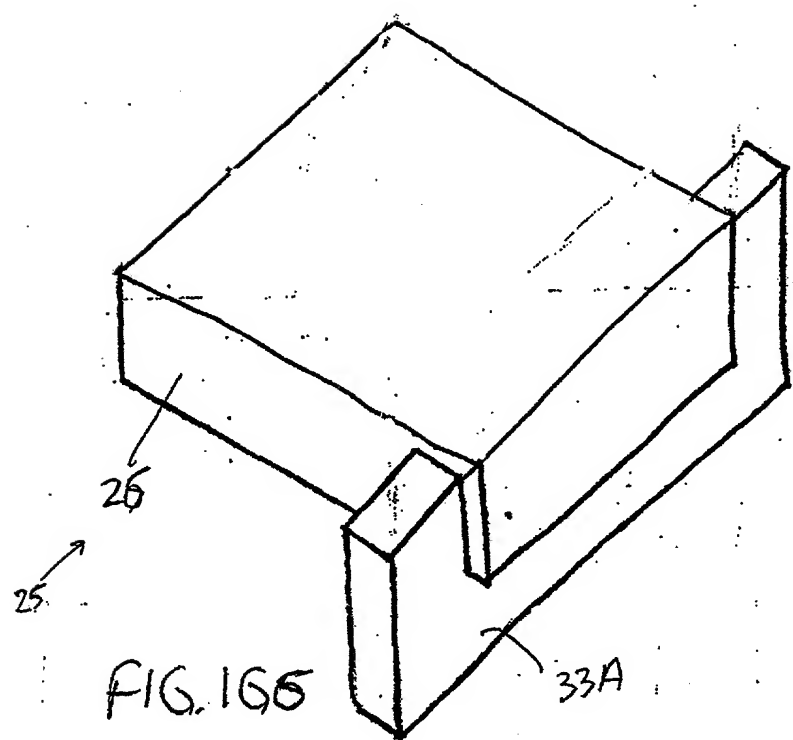


FIG. 165

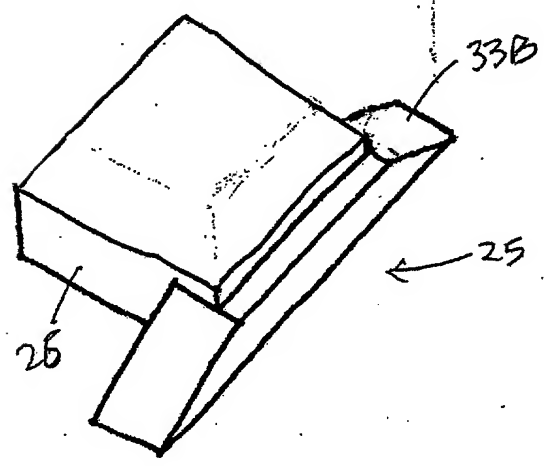


FIG. 167

202020-29489001

13/385

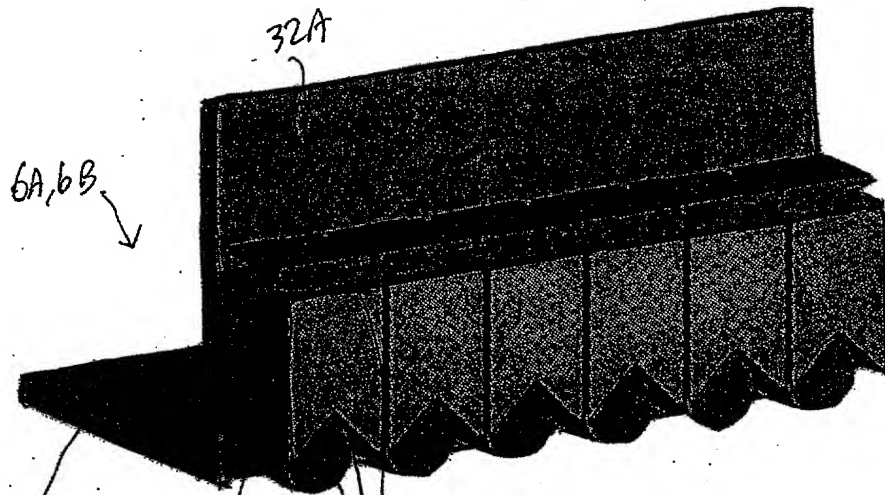


FIG. 1G 8

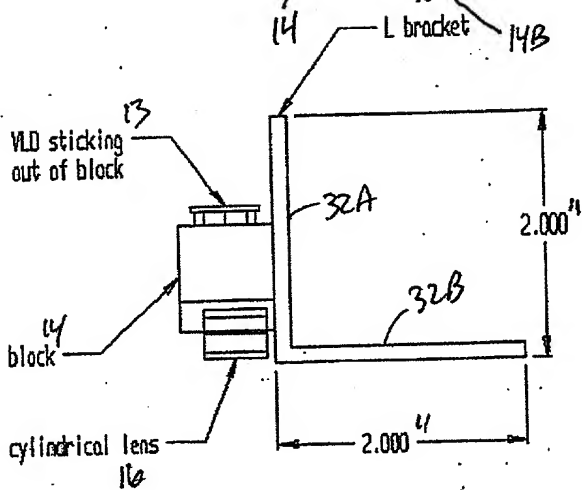


FIG. 1G.9

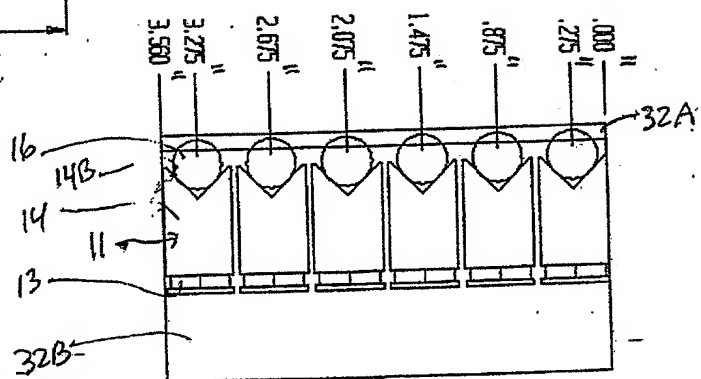


FIG. 1G10

14/385

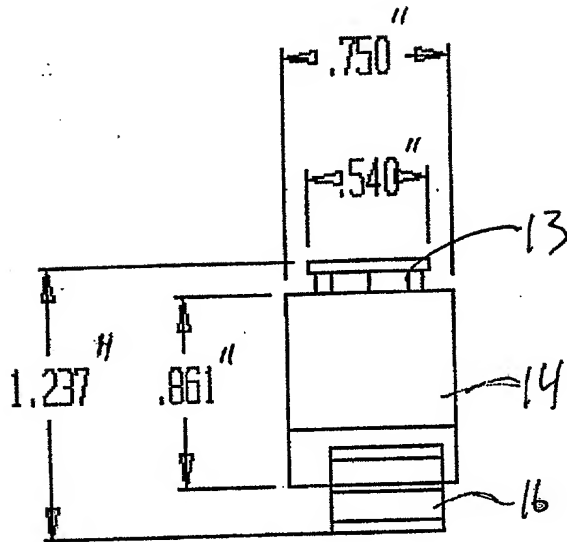


FIG. 1G11

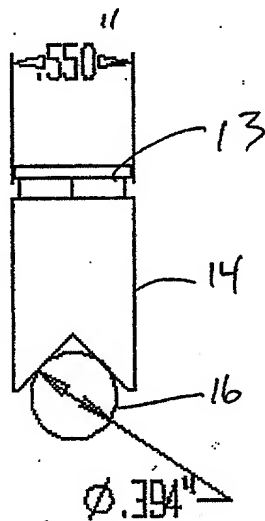


FIG. 1G12

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15/ 385

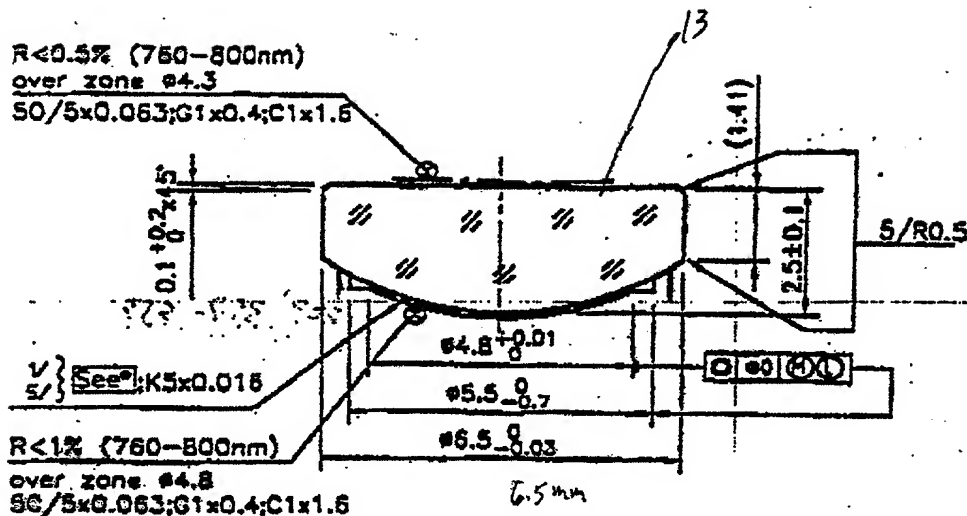


FIG. 1G13

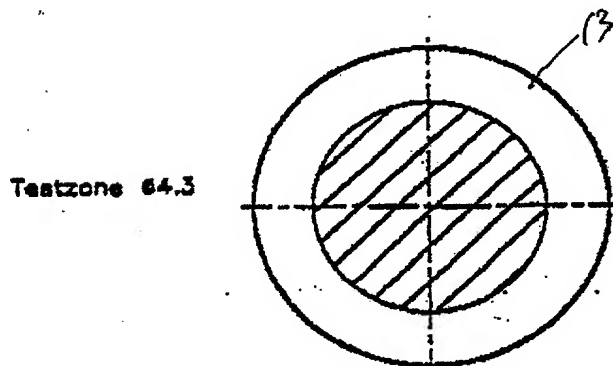


FIG. 1G14

16/385

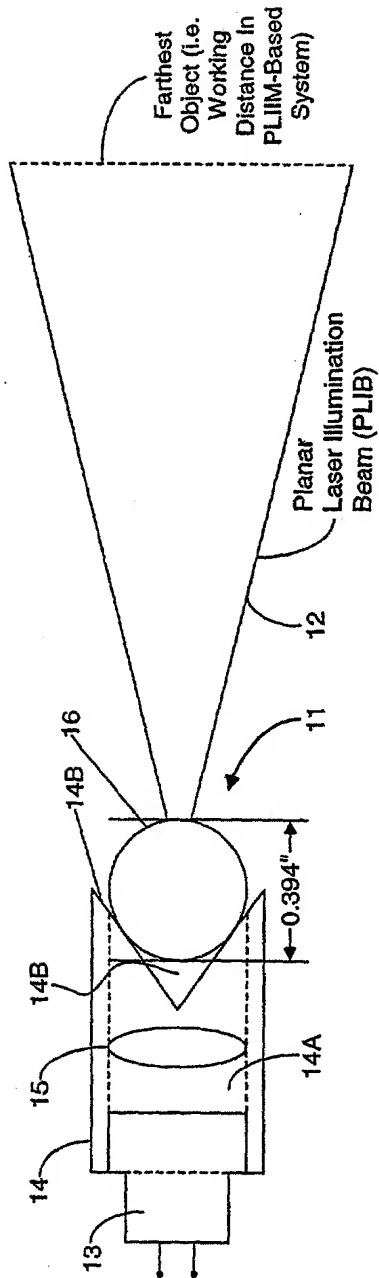


FIG. 1G15A

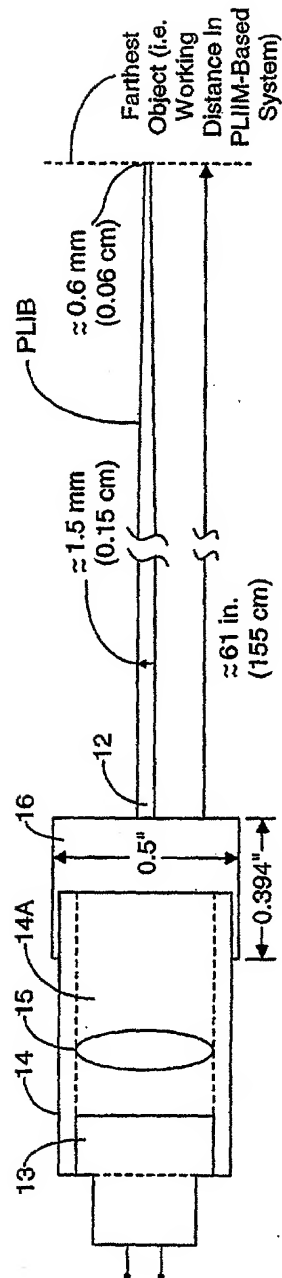


FIG. 1G15B

17/385

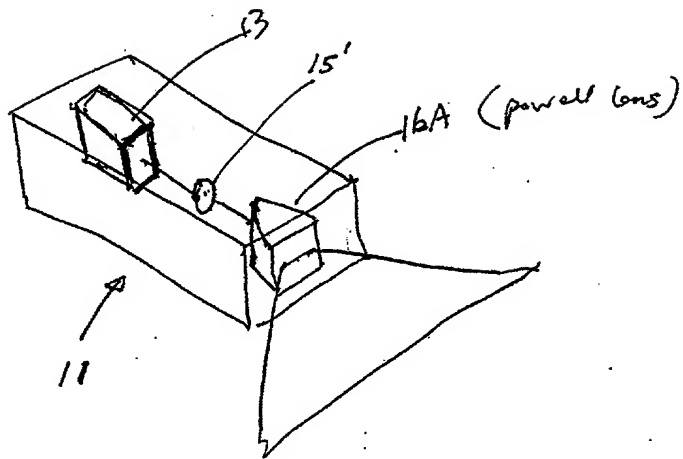


FIG. 1G.16A

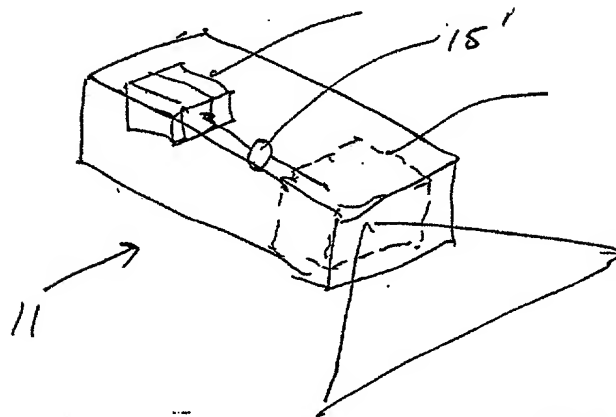


FIG. 1G.16B

PLIM of  
powell lens

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10/385

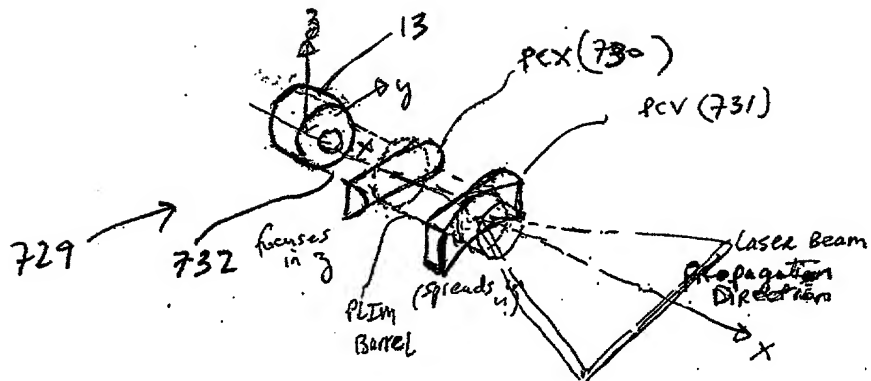


FIG. 16.17A

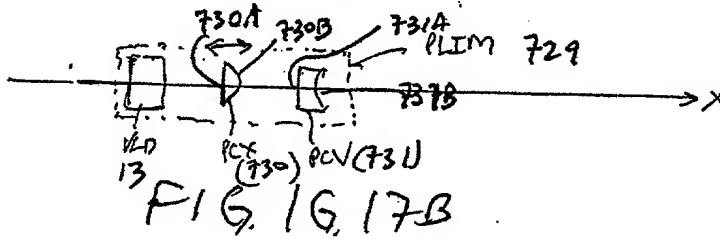


FIG. 16.17B

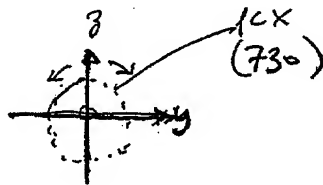


FIG. 16.17C

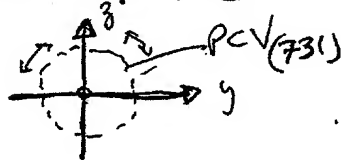


FIG. 16.17D



FIG. 16.17E

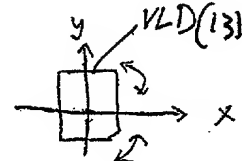
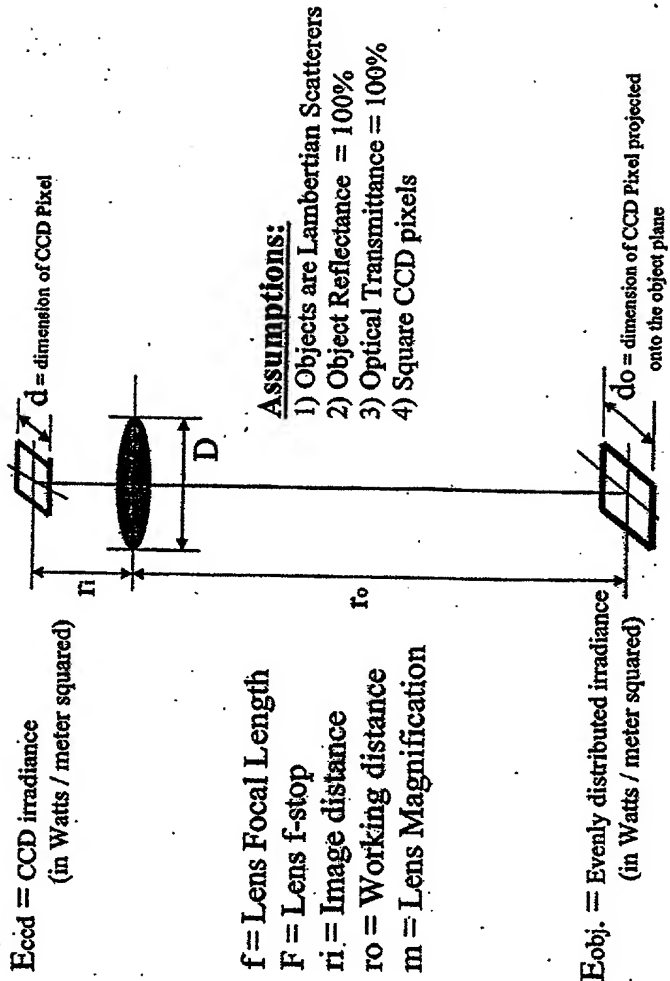


FIG. 16.17F

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19/385



CCD-Based Scanner

FIG. 1H6

FIRST GENERALIZED METHOD  
OF Reducing Speckle-Noise  
PATTERNS AT Image  
Detection array OF the  
SPM Subsystem (3)

20/ 385

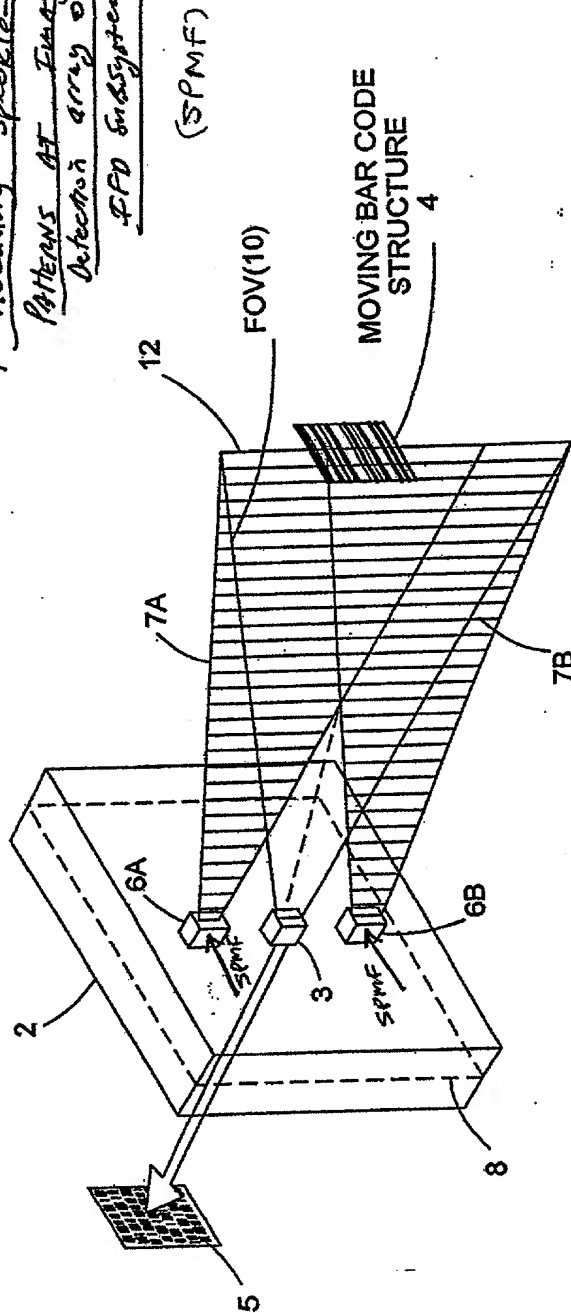
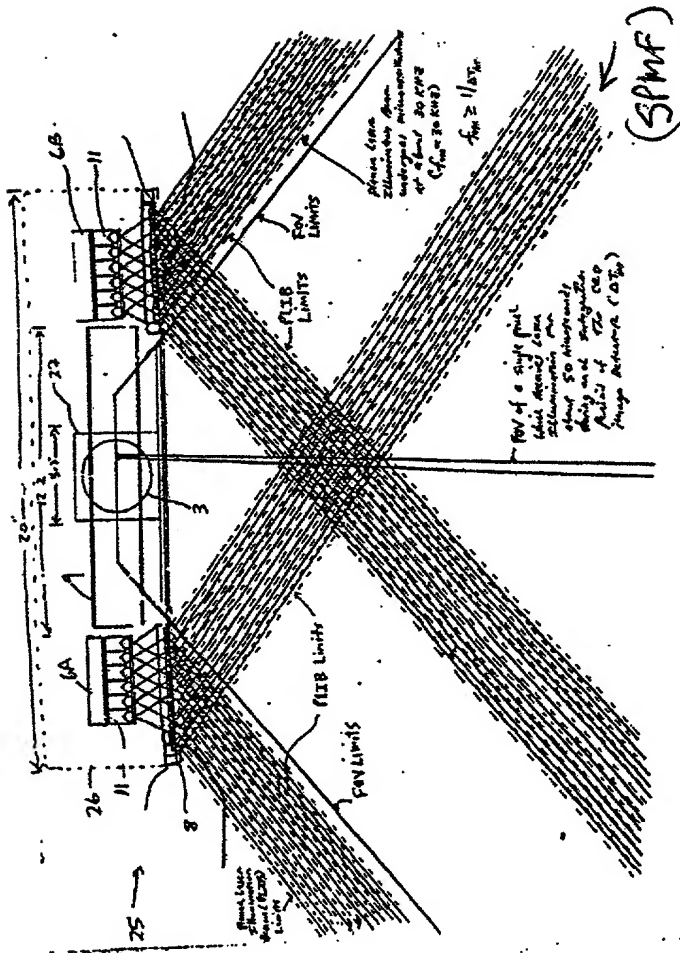


FIG. 1I1

$$21/385$$


Prior to object illumination

FIG. 1I 2A

22/ 385

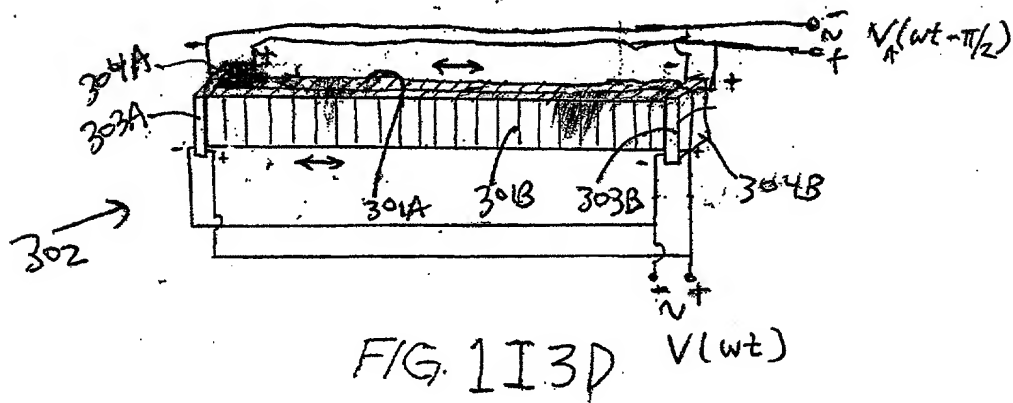
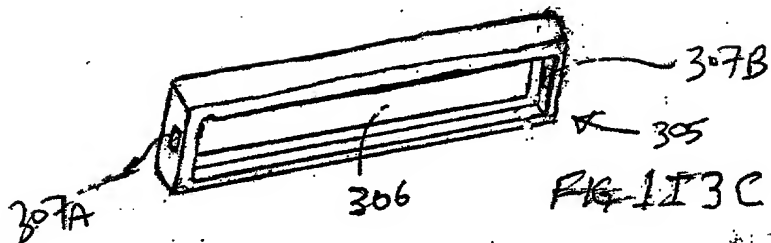
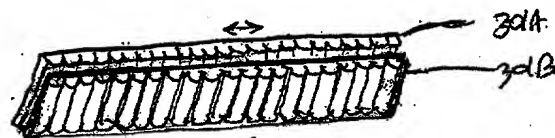
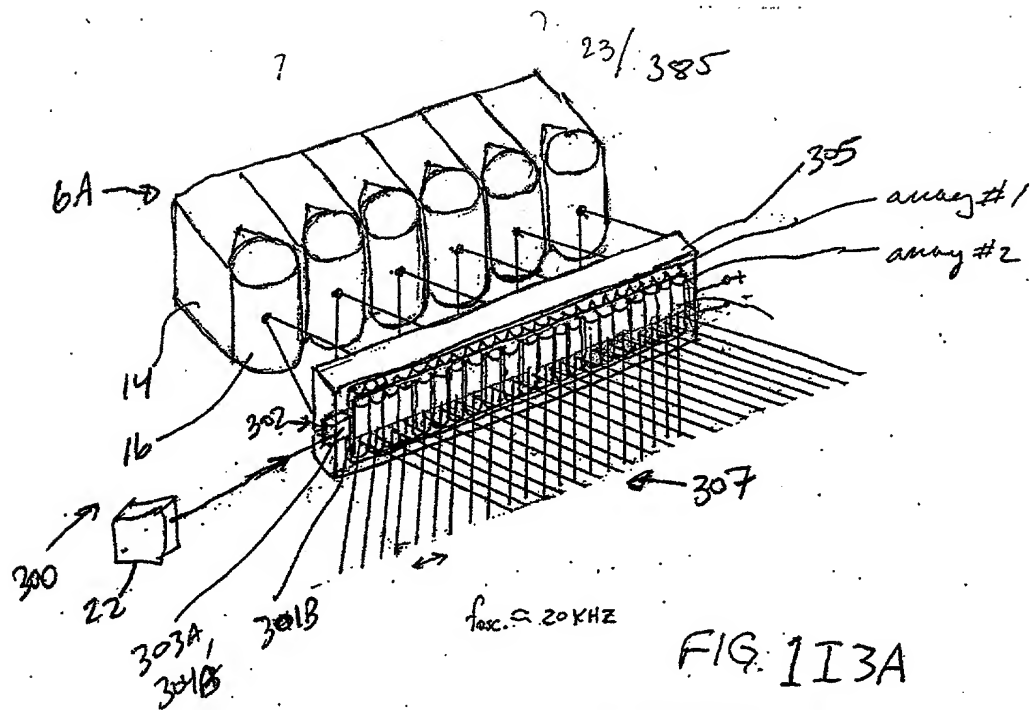
**The First Generalized Speckle-Noise Pattern Reduction Method**  
**Of The Present Invention**

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial phase of the transmitted PLIB along the planar extent thereof according to a spatial phase modulation function (SPMF) so as to produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the power of the speckle-noise pattern observed at the image detection array.

FIG. 1I2B

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24/ 385

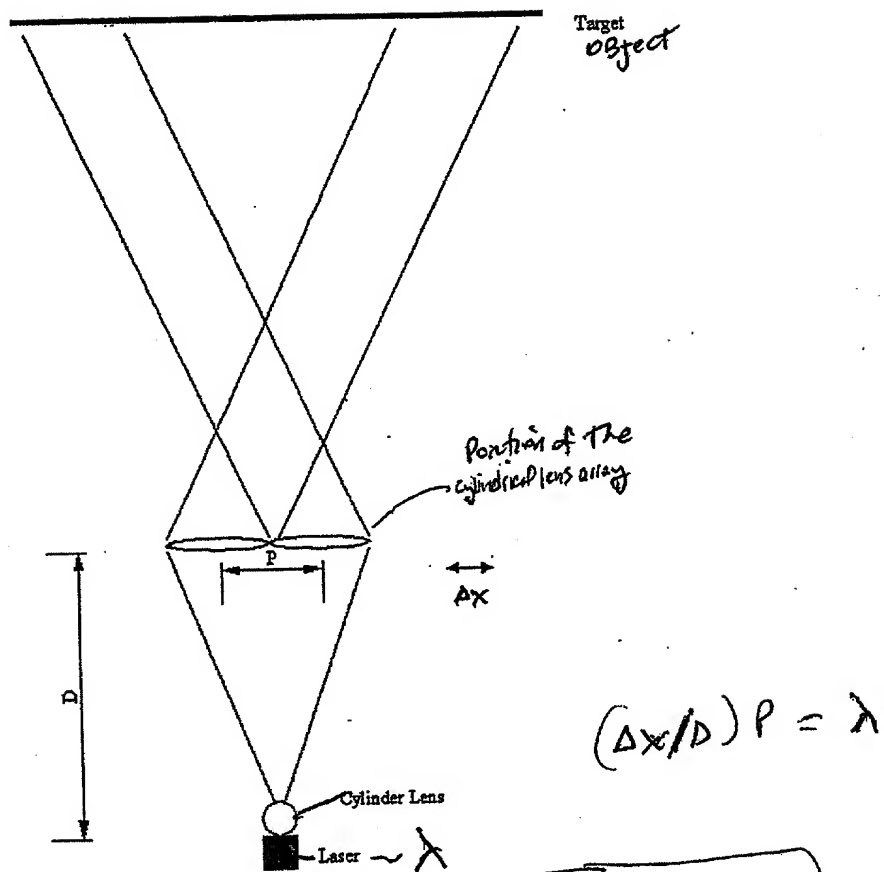


Figure 1

$$\Delta x \geq \frac{\lambda \cdot D}{P}$$

FIG. 1I3E

25/385



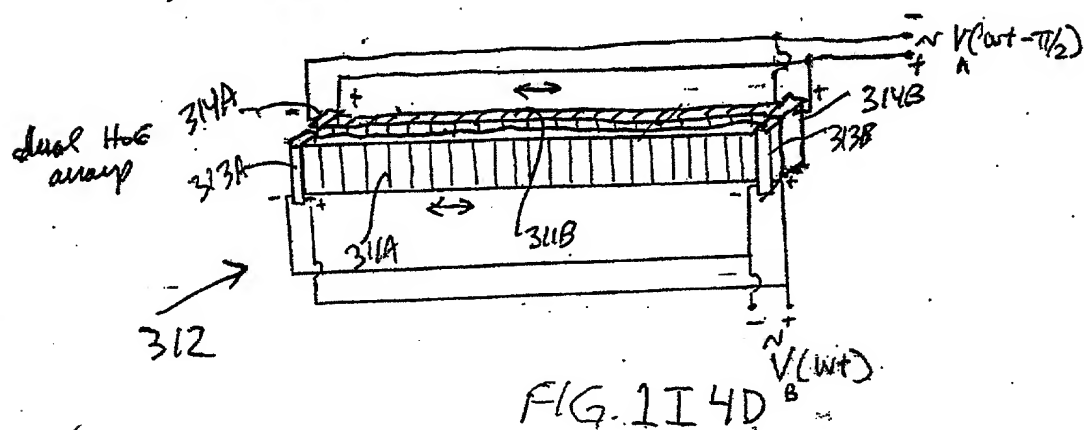
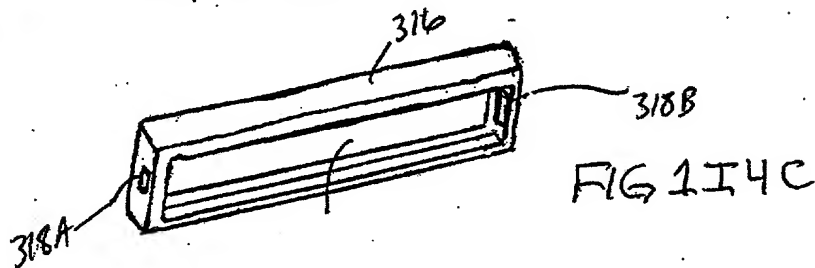
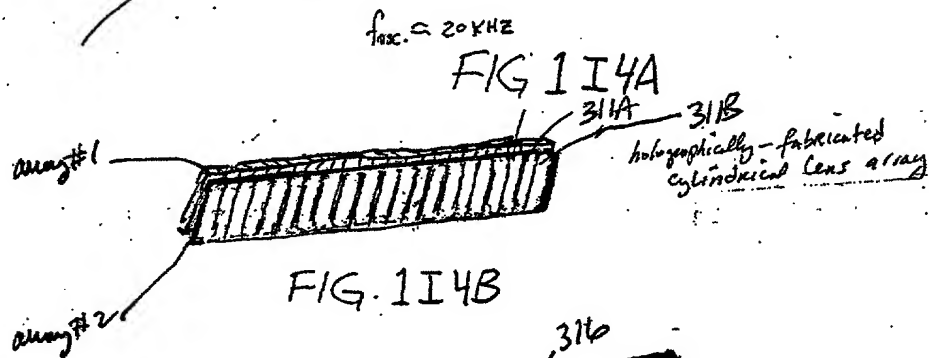
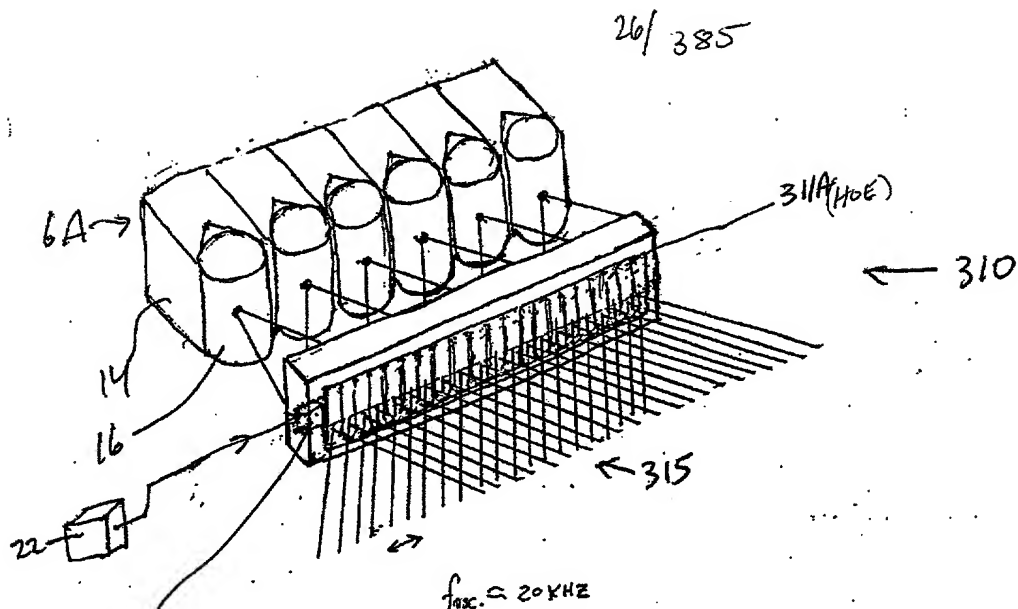
FIG. 1I3F



FIG 1I3G

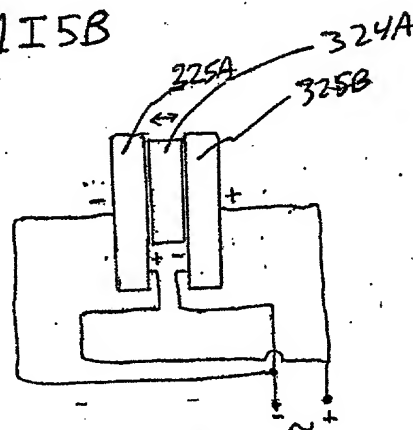
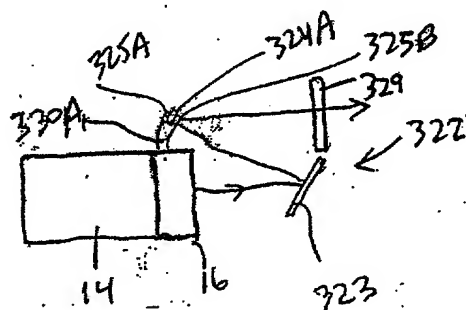
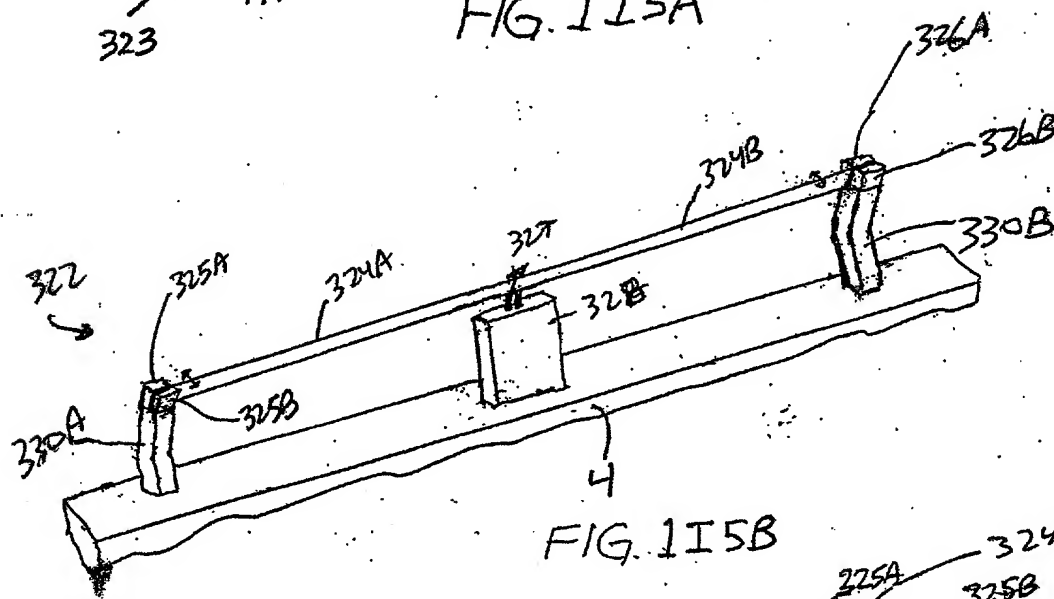
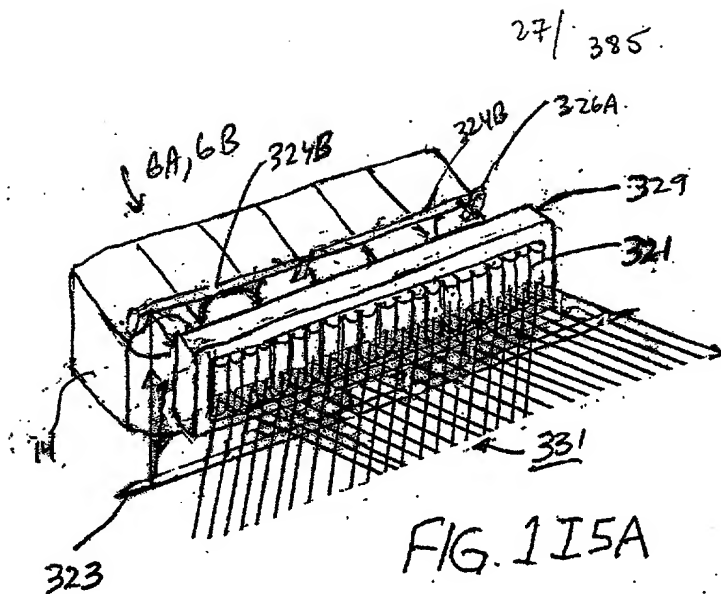
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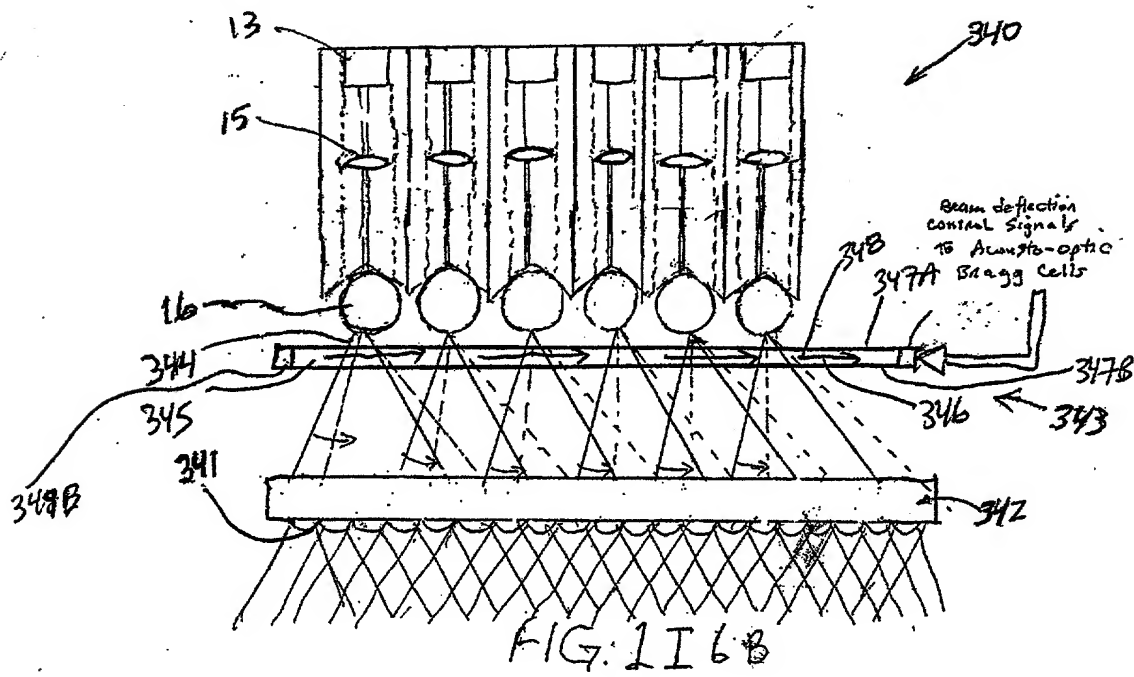
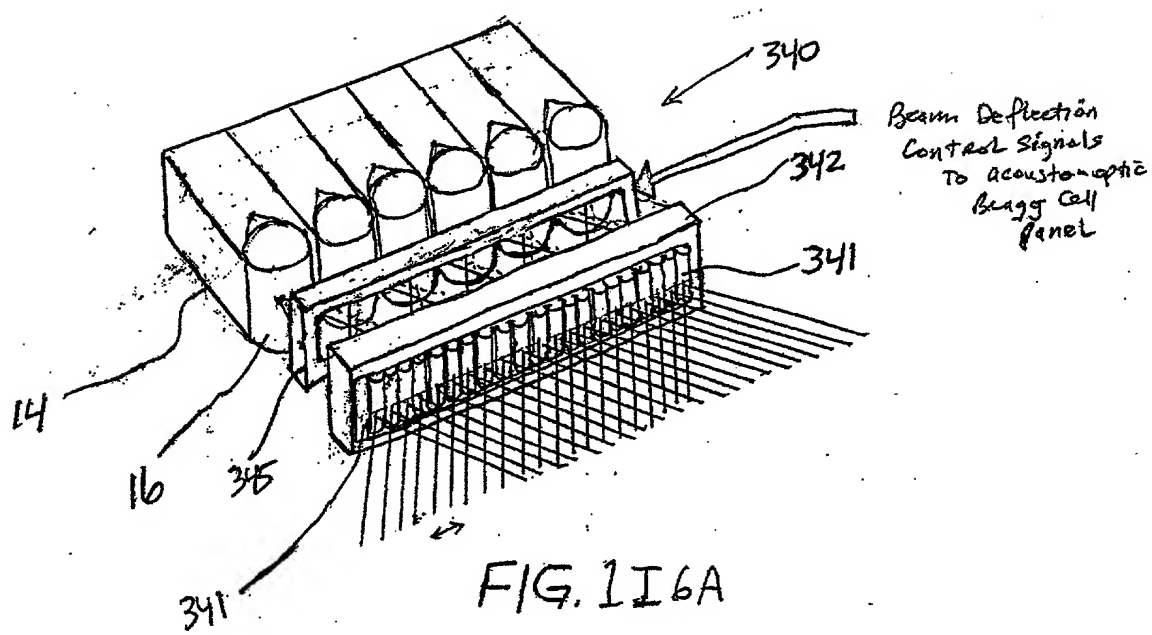


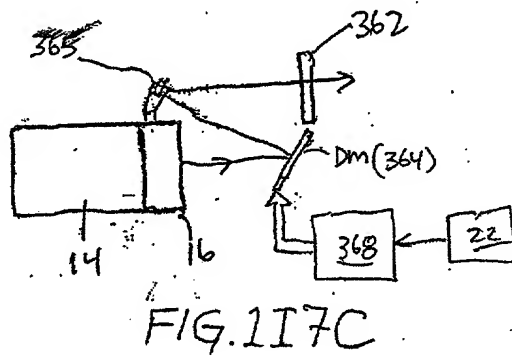
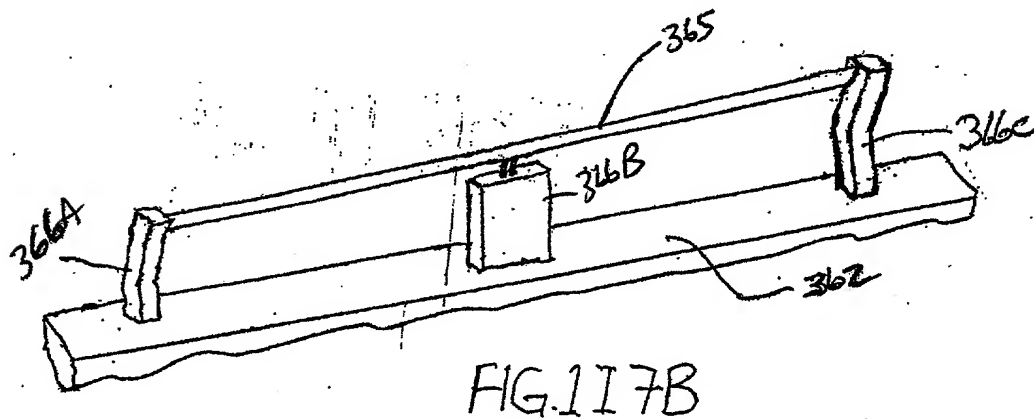
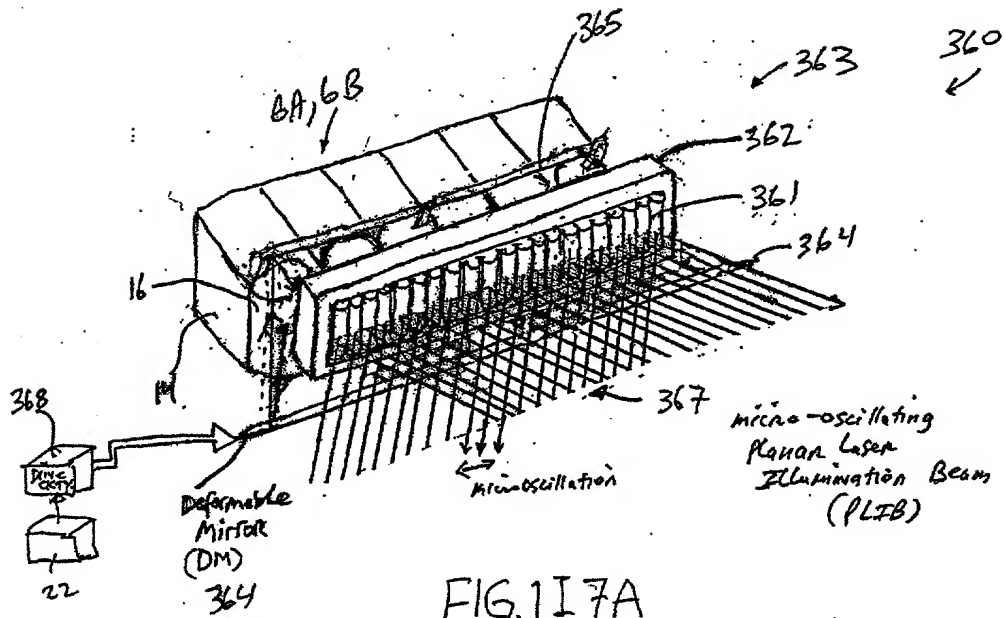


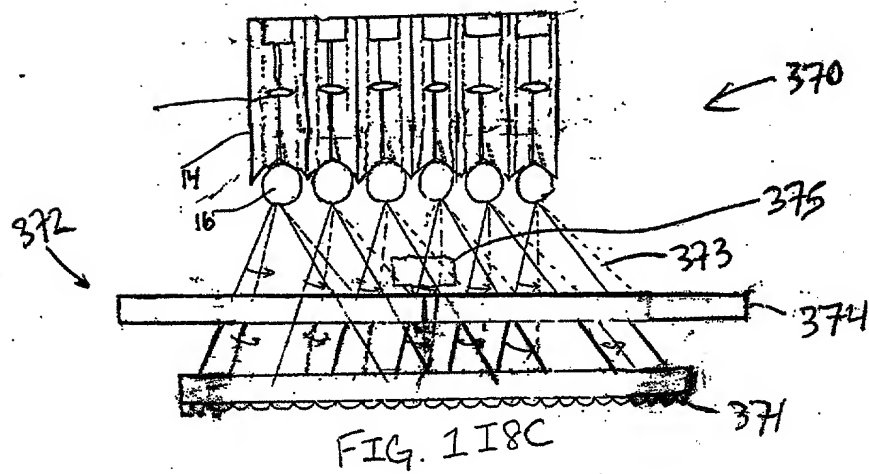
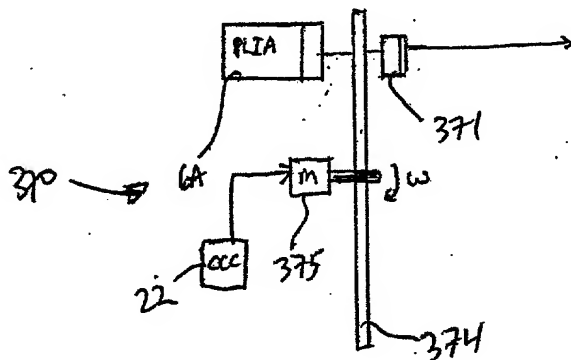
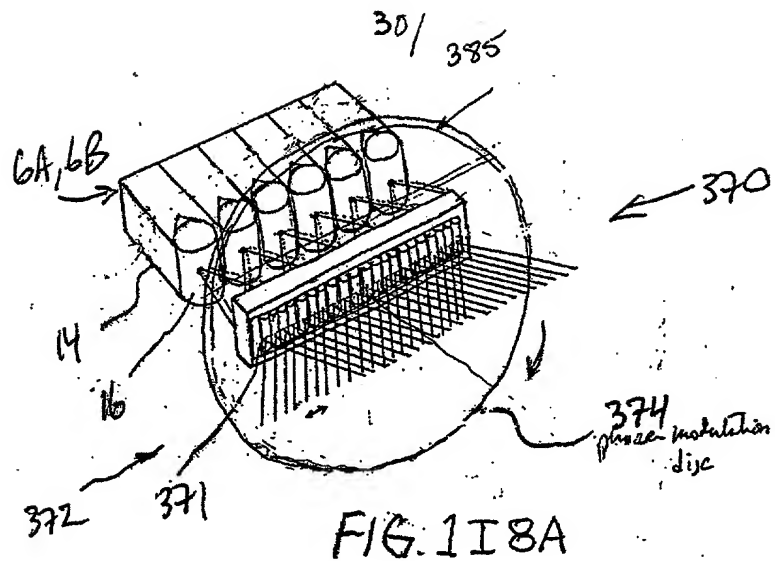
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28/ 385







31 / 385

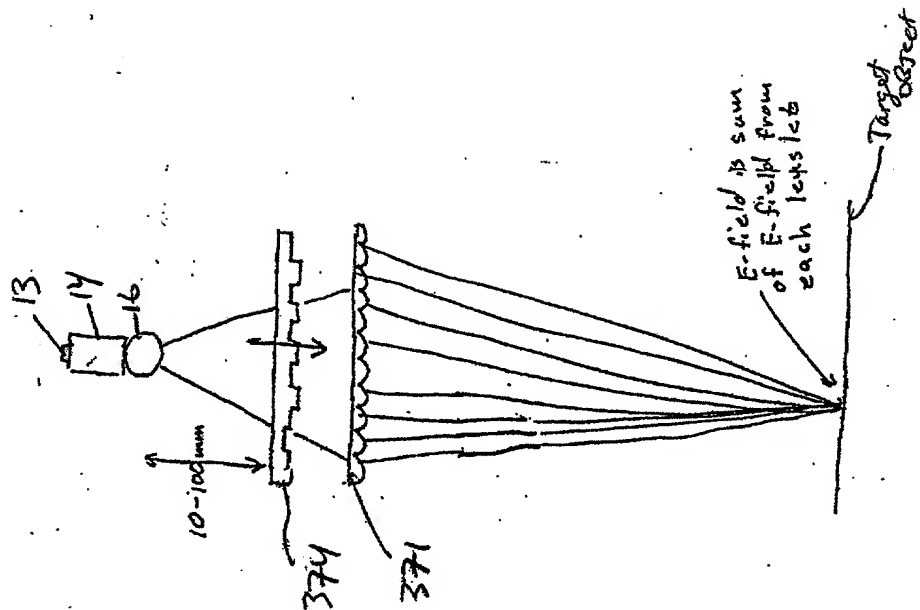


FIG 1I8E

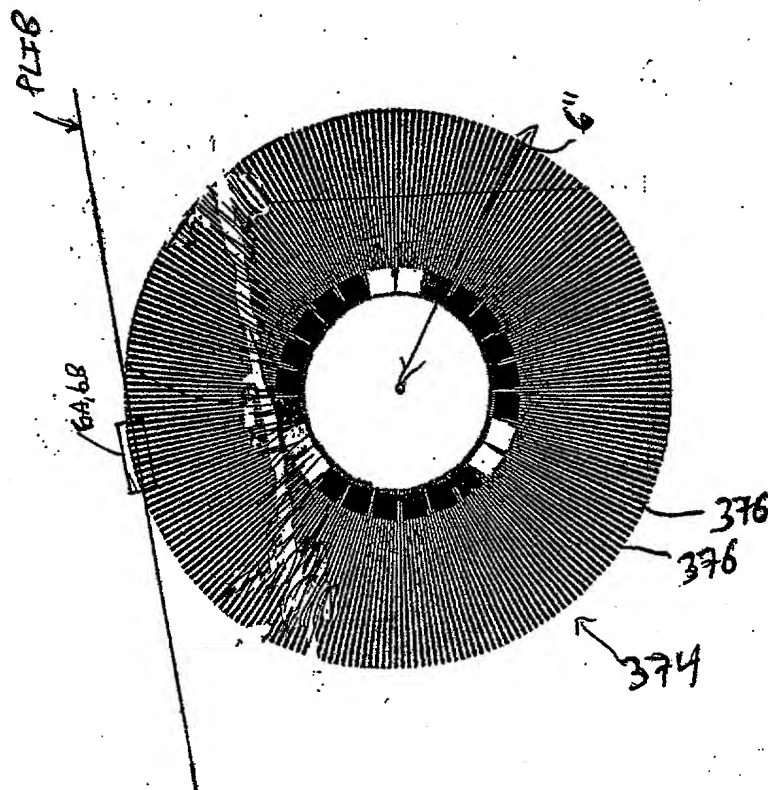
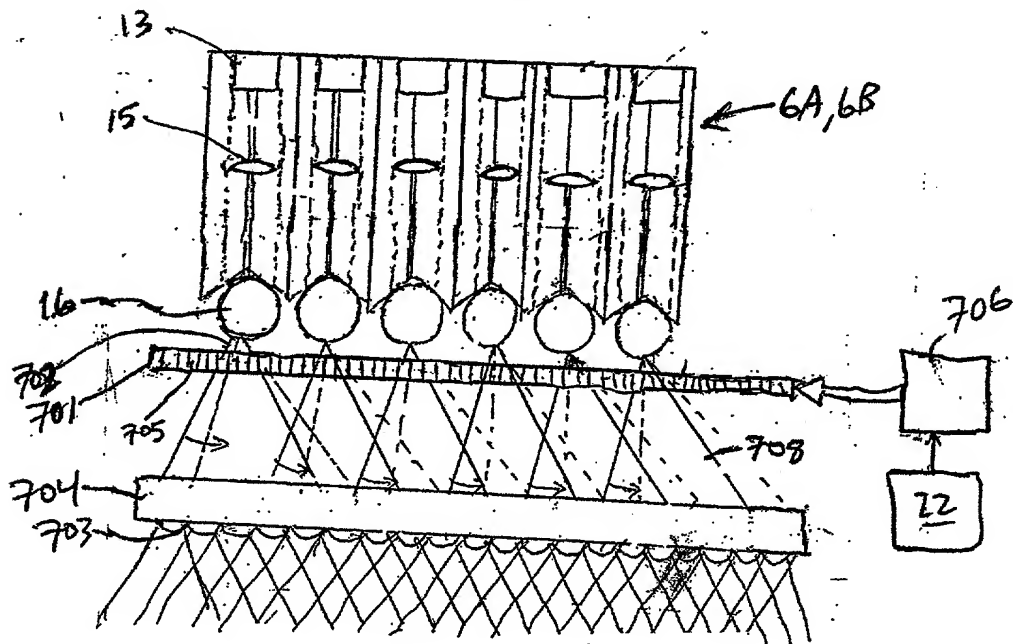
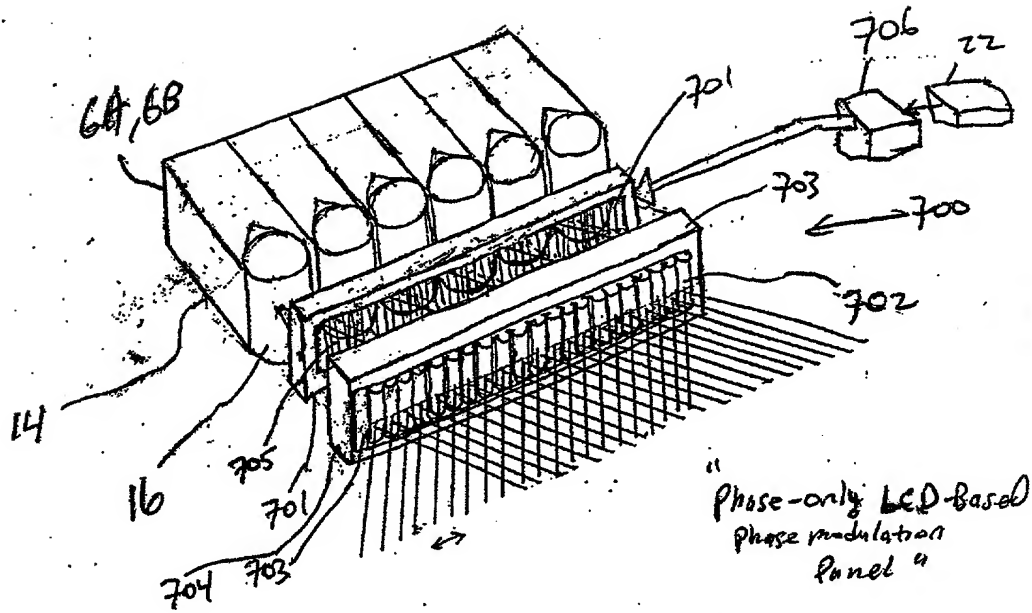


FIG 1I8D



33/ 385

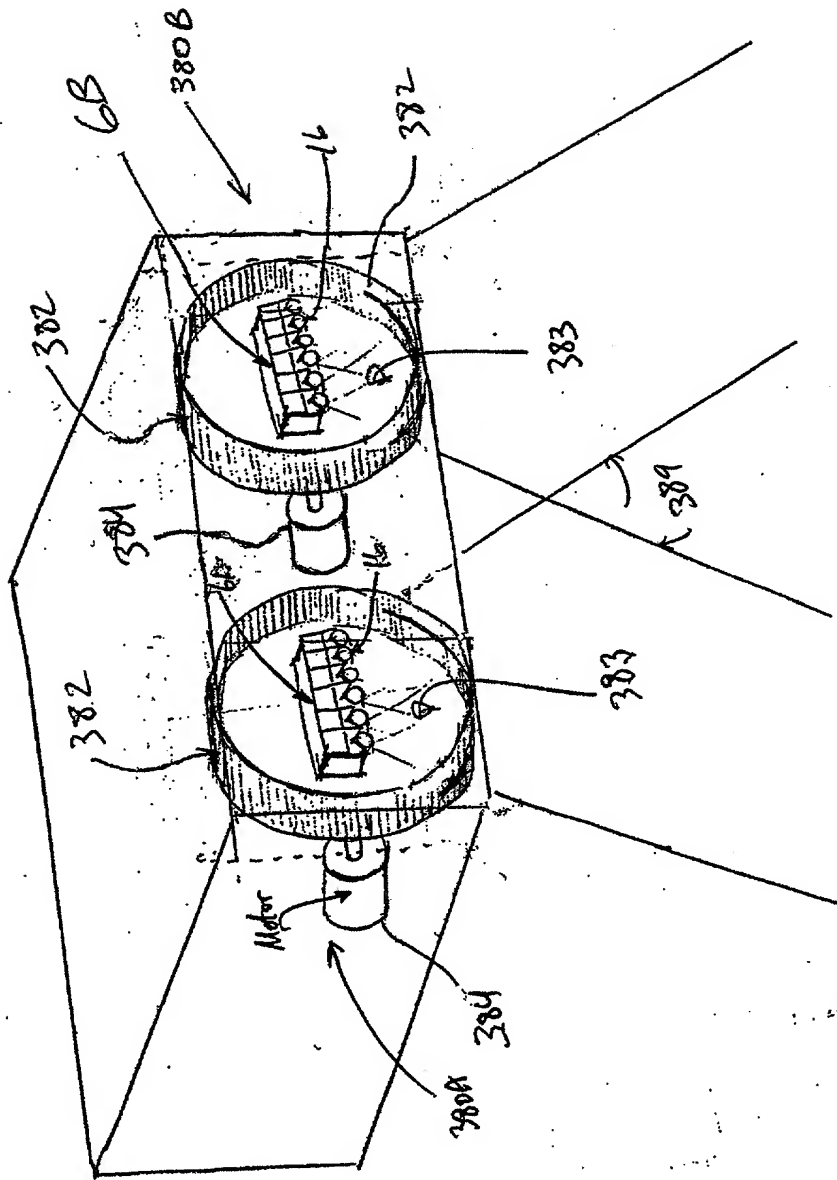
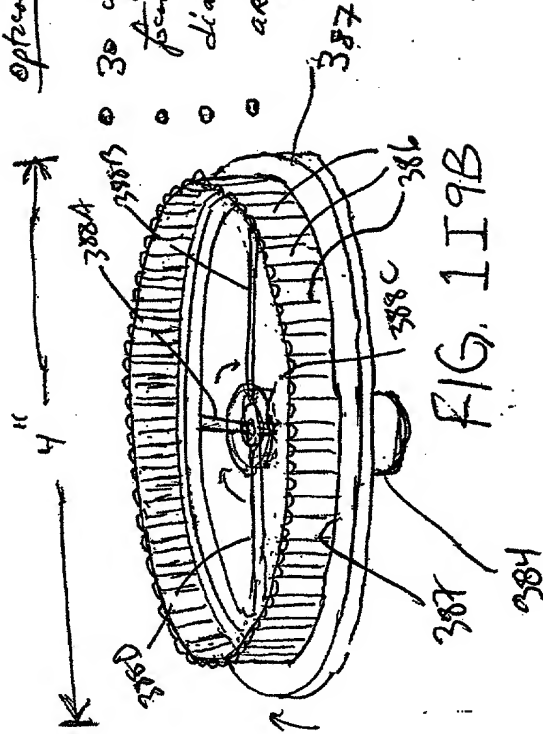


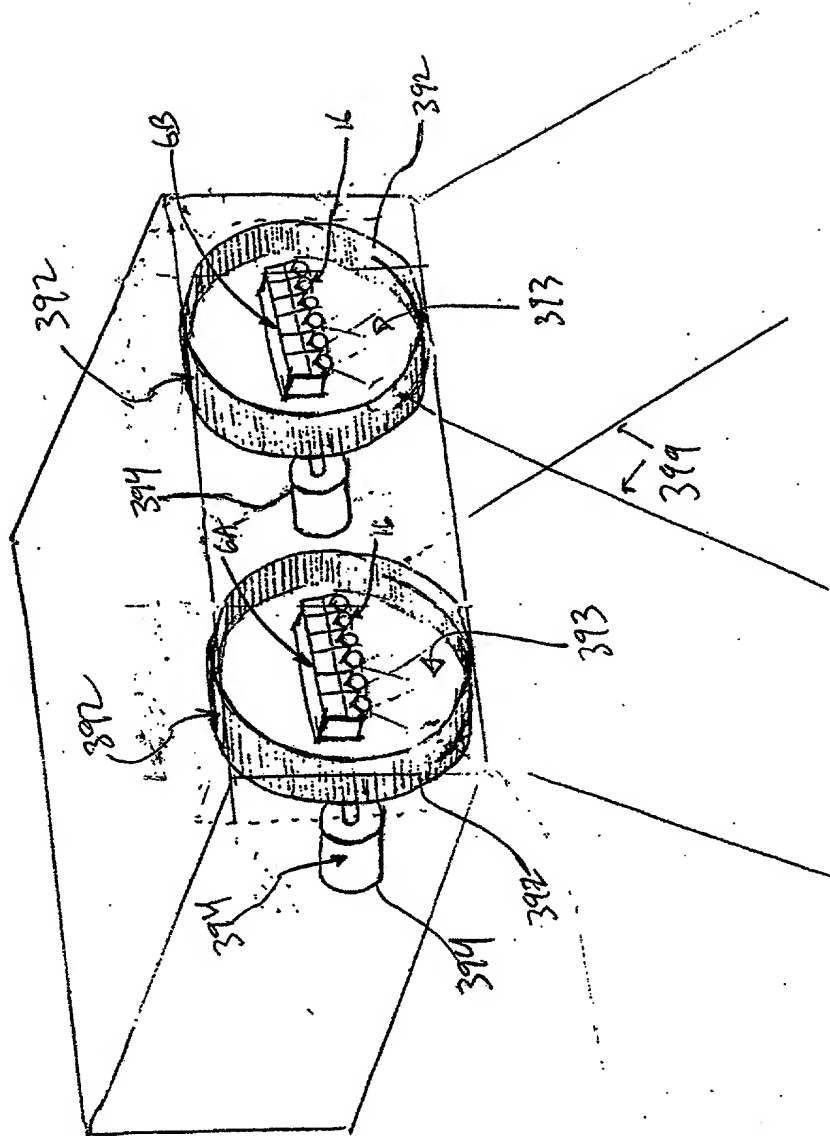
FIG. 11 7A

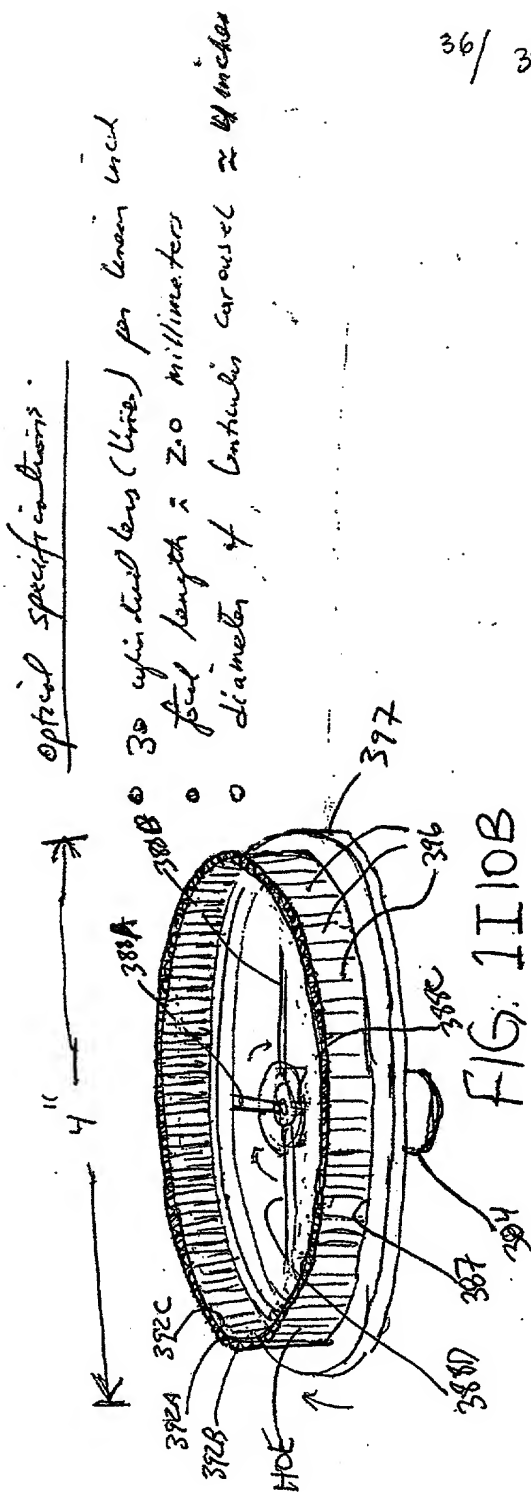
Optical specifications:

- 30 apertured lens (lens) per inner inch
- focal length  $\approx 2.0$  millimeters
- diameter of lenslets covered  $\approx 4$  inches
- acrylic material









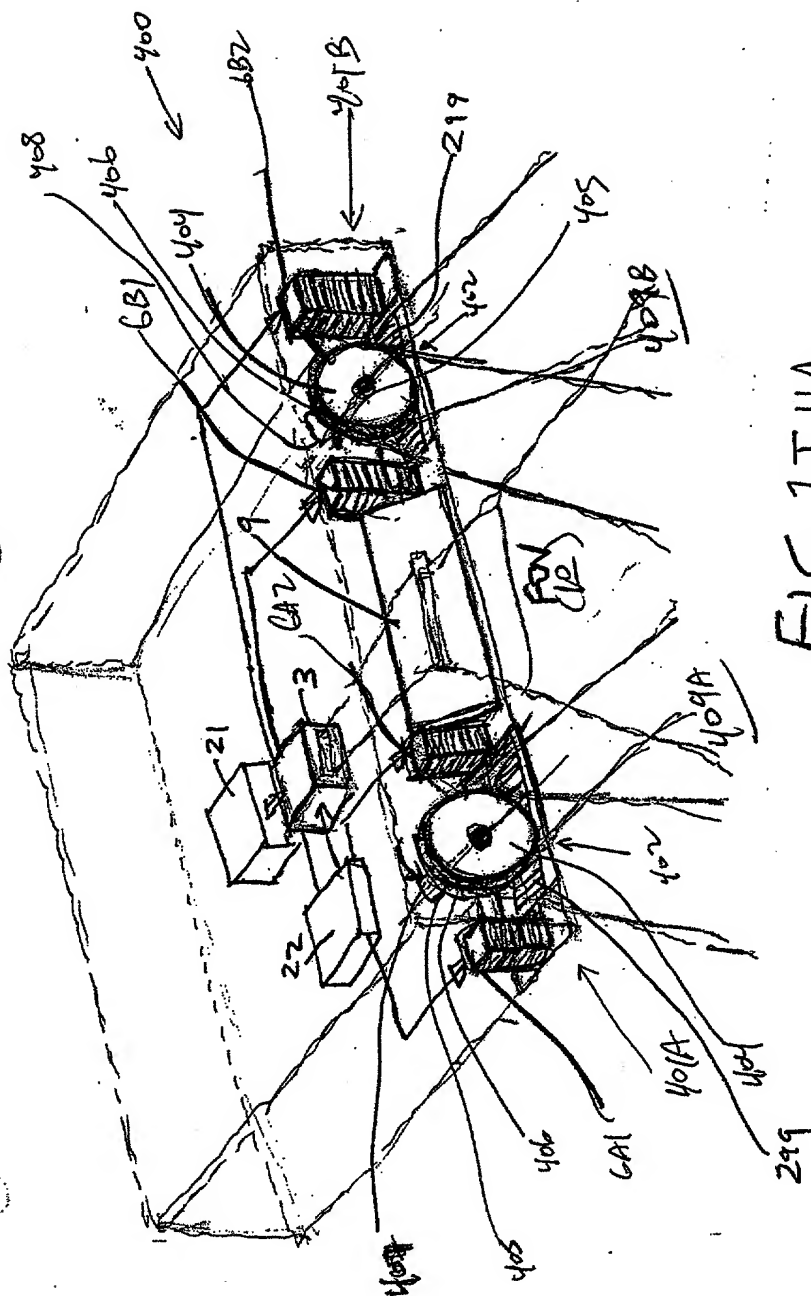
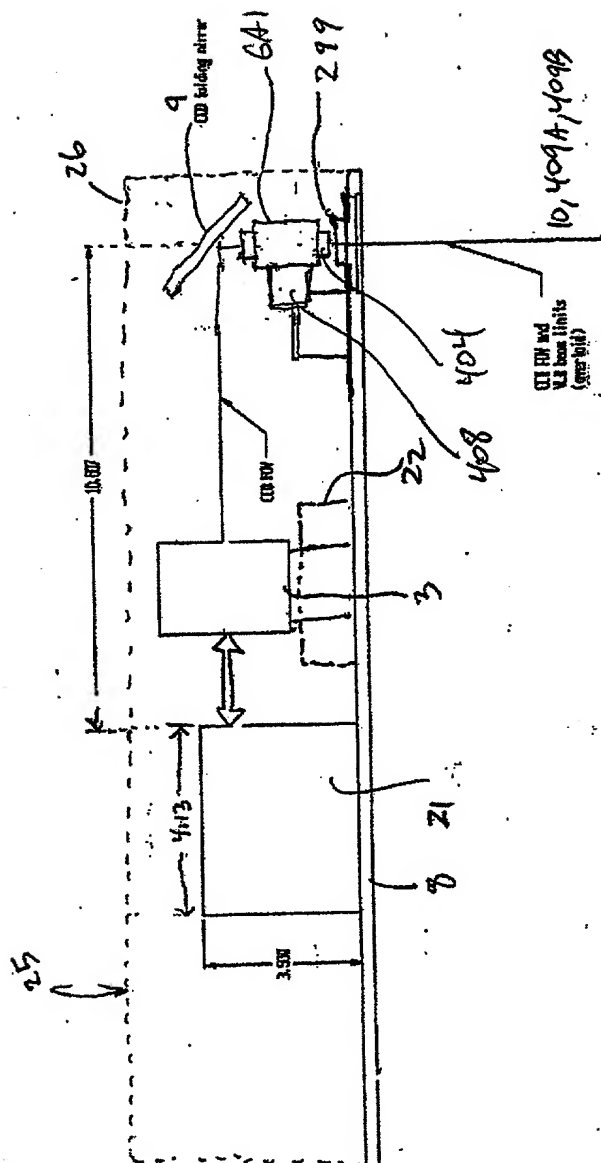


FIG. 1 IIA

[illegible]

39/ 385

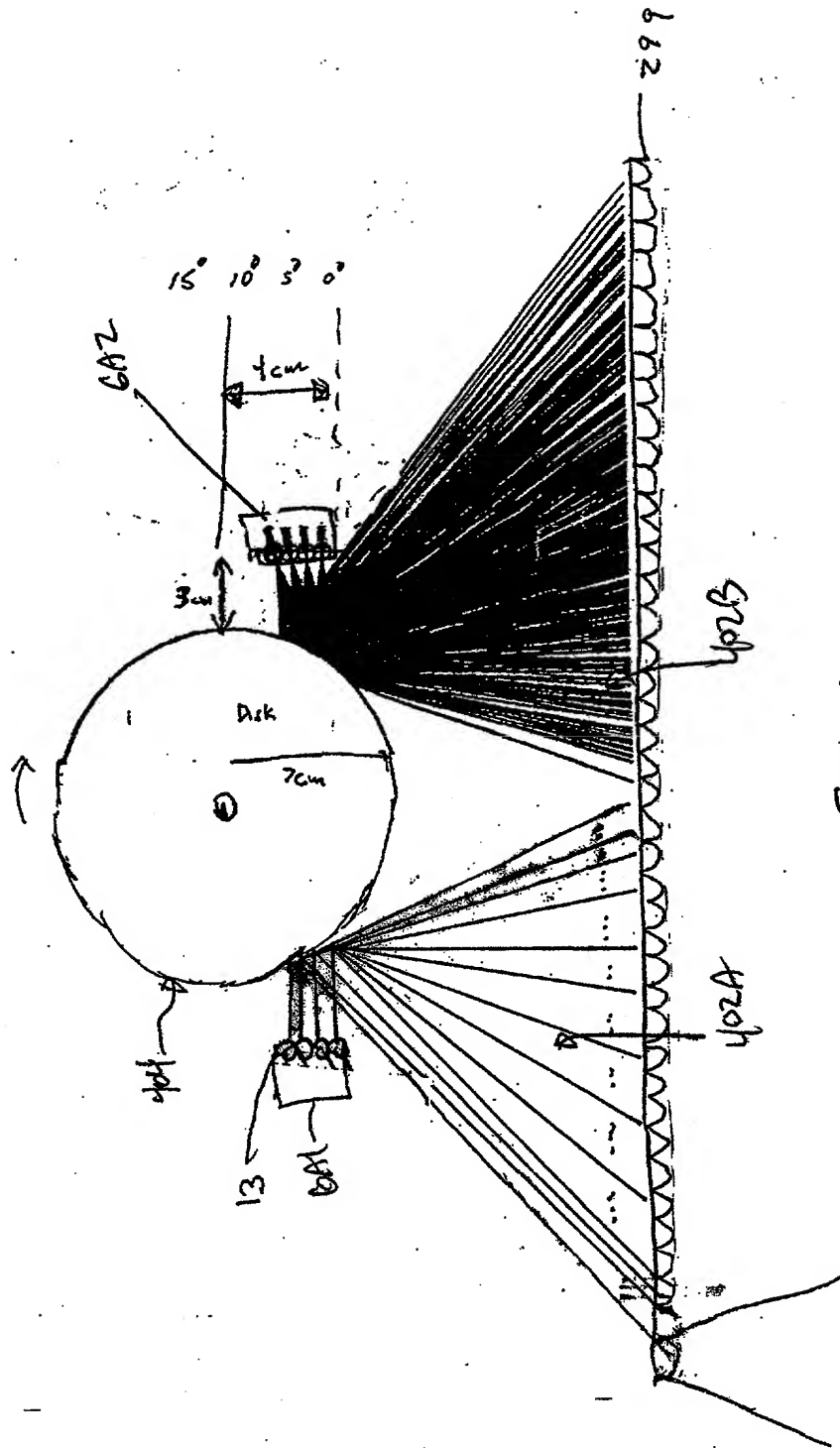


FIG. 1I11C

202020-29489001

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40/385

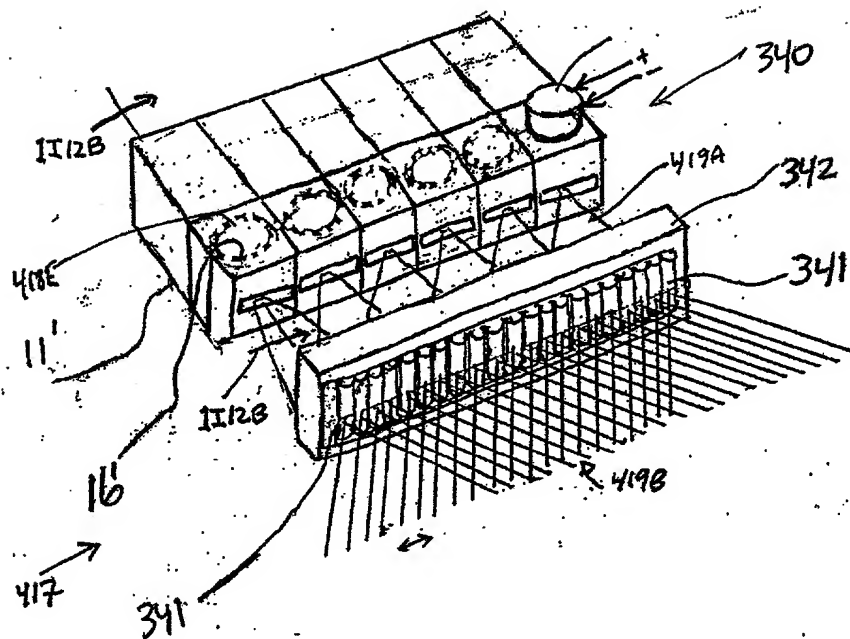


FIG. 1I12A

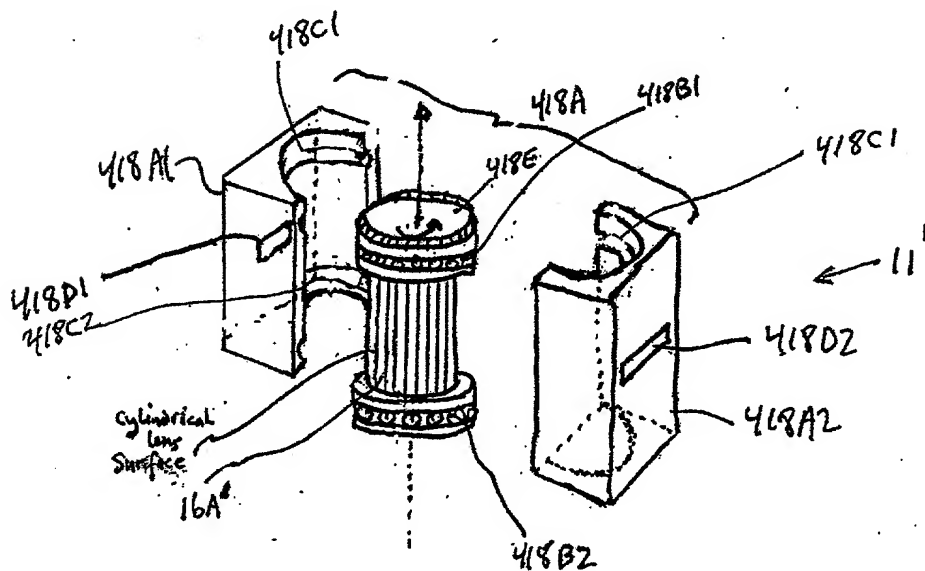


FIG. 1I12B

41/ 385

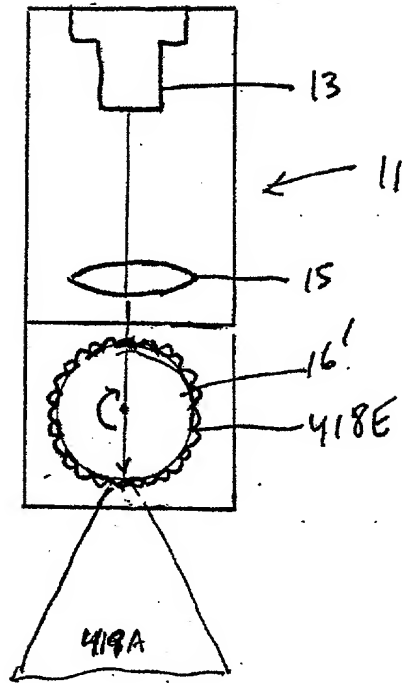


FIG. 1I12C

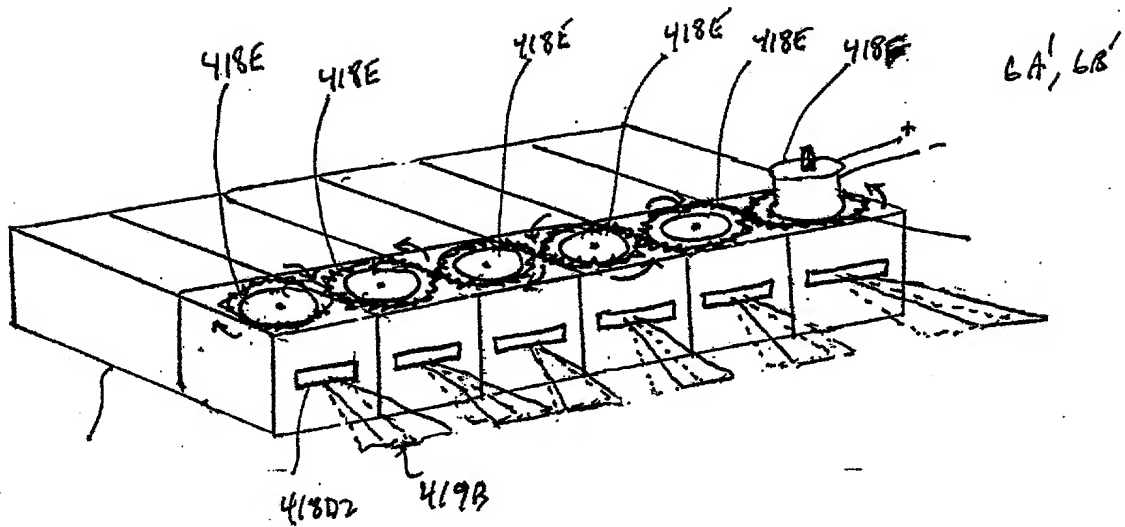


FIG. 1I12D

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42/ 385

Second Generalized Method of  
Reducing Spackle-Noise Patterns  
at Image Detection Array  
of the FFD Subsystem (3)

(TIME)

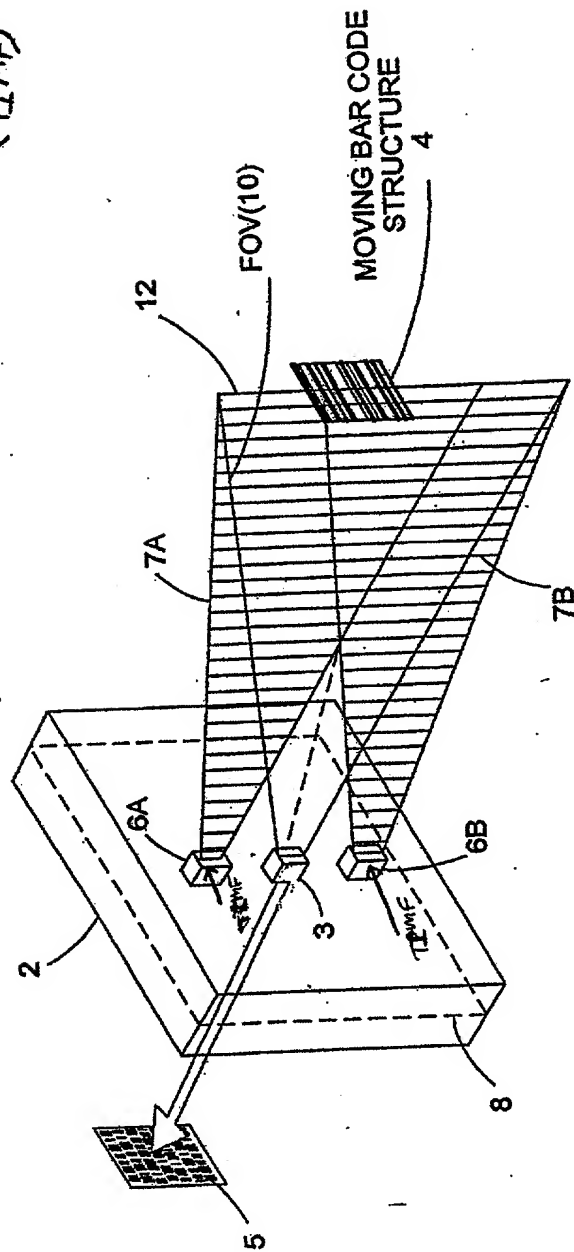
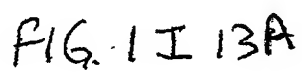


FIG. 11B



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44/385

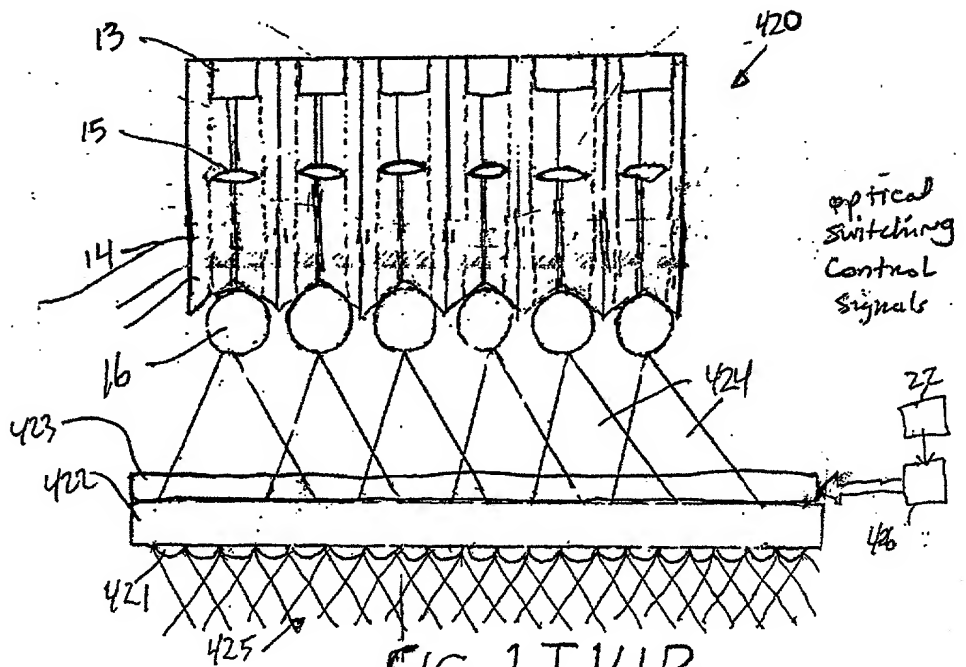
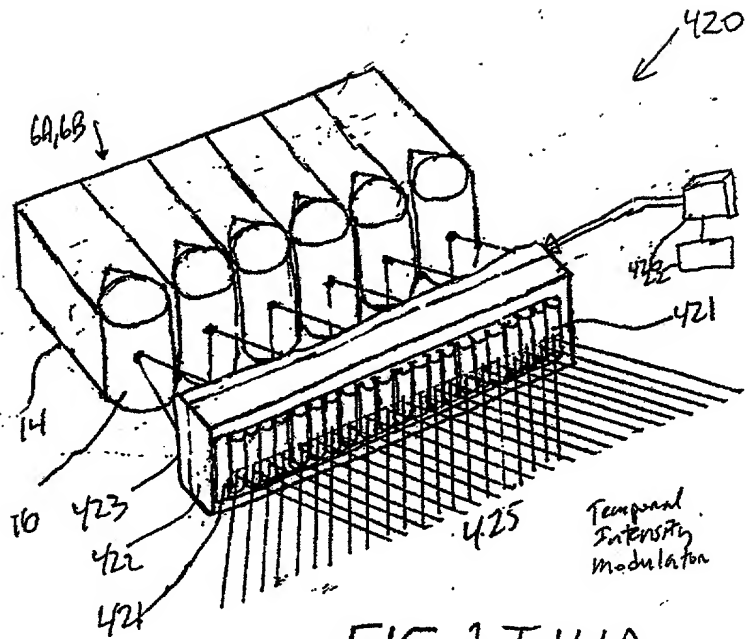
The Second Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the transmitted PLIB along the planar extent thereof according to a temporal intensity modulation function (TIME) so as to

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/3B



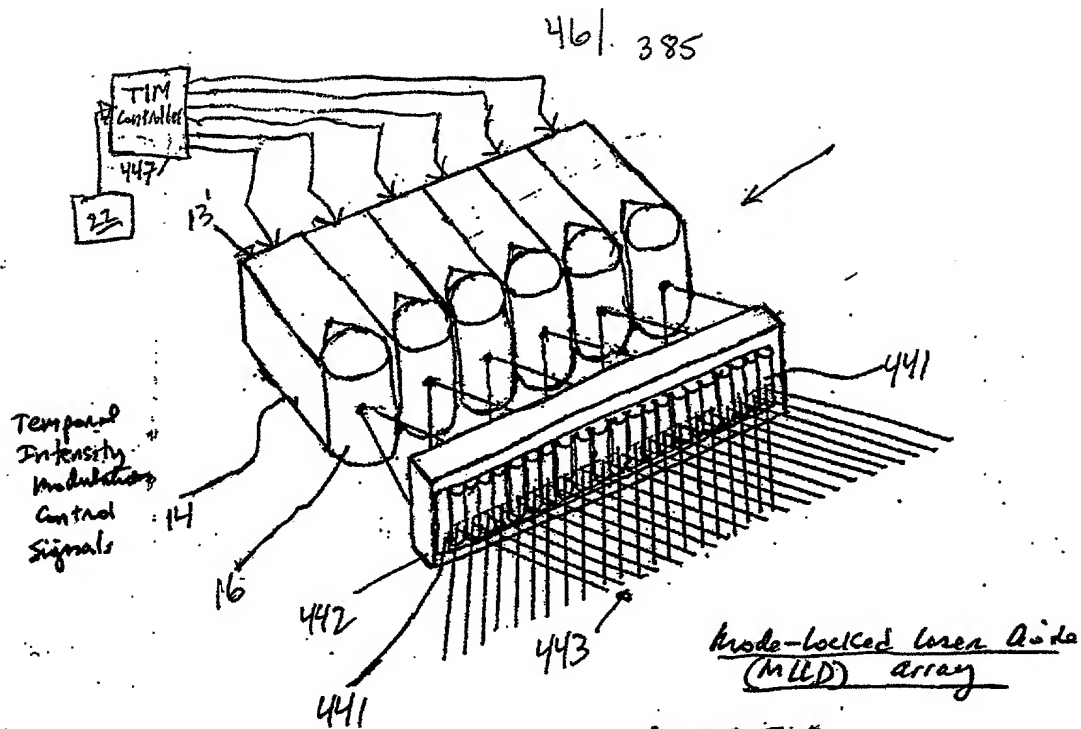


FIG. 1I15A

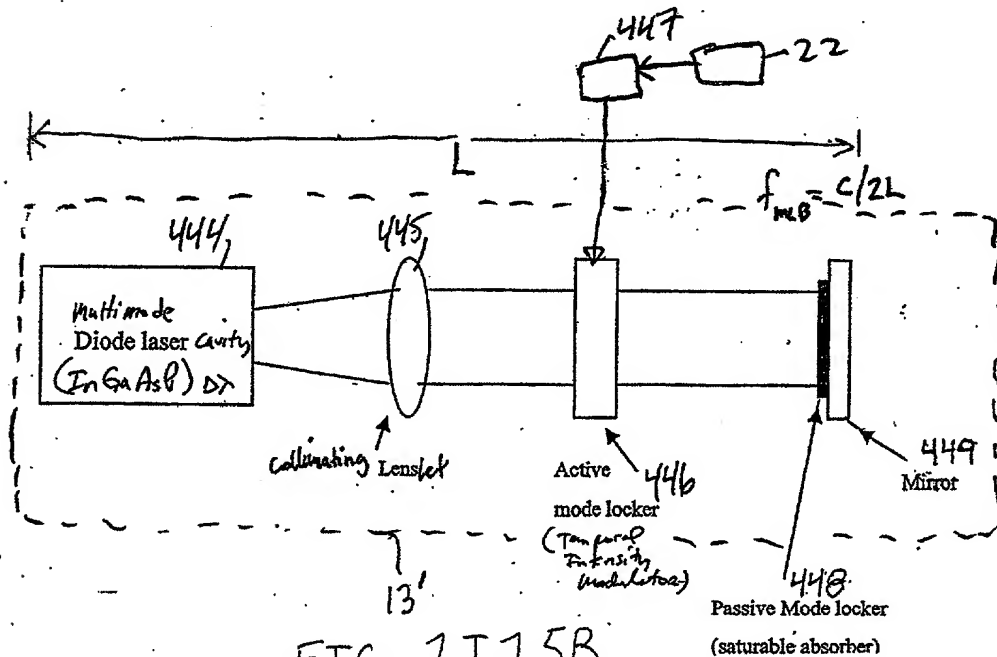
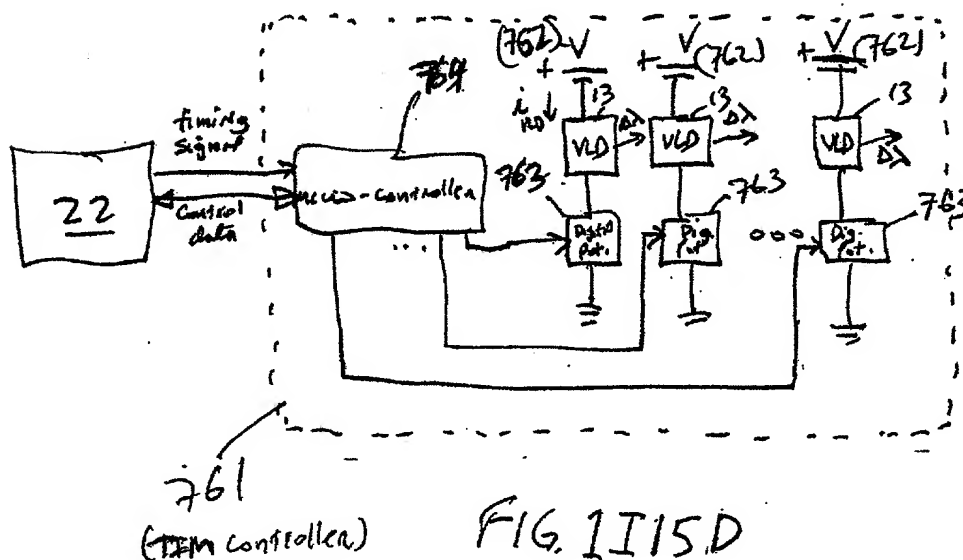
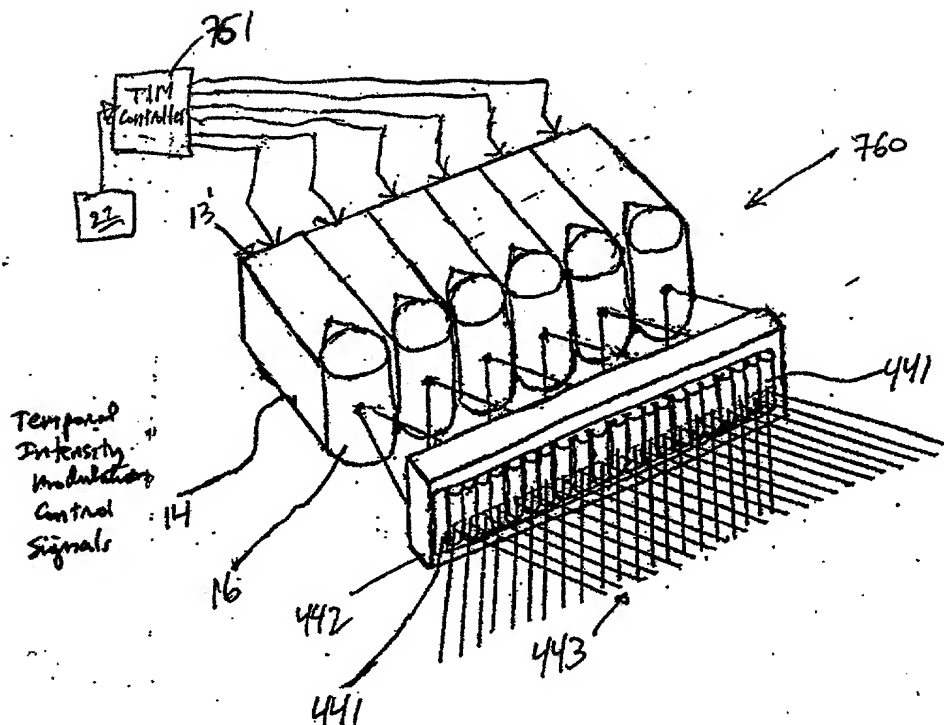
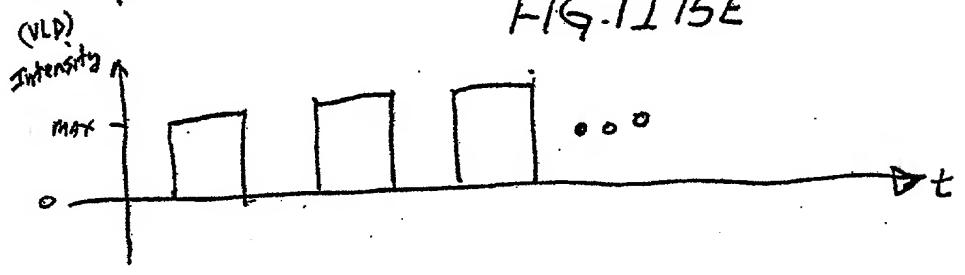
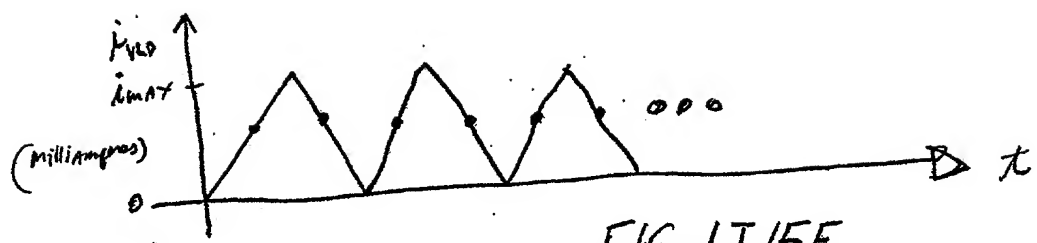


FIG. 1I15B



48/385



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49/ 385

Third Generalized Method of  
Reducing Speckle-Noise Patterns  
at Image Detection Array  
of FPD Subsystem (3)

(TIME)

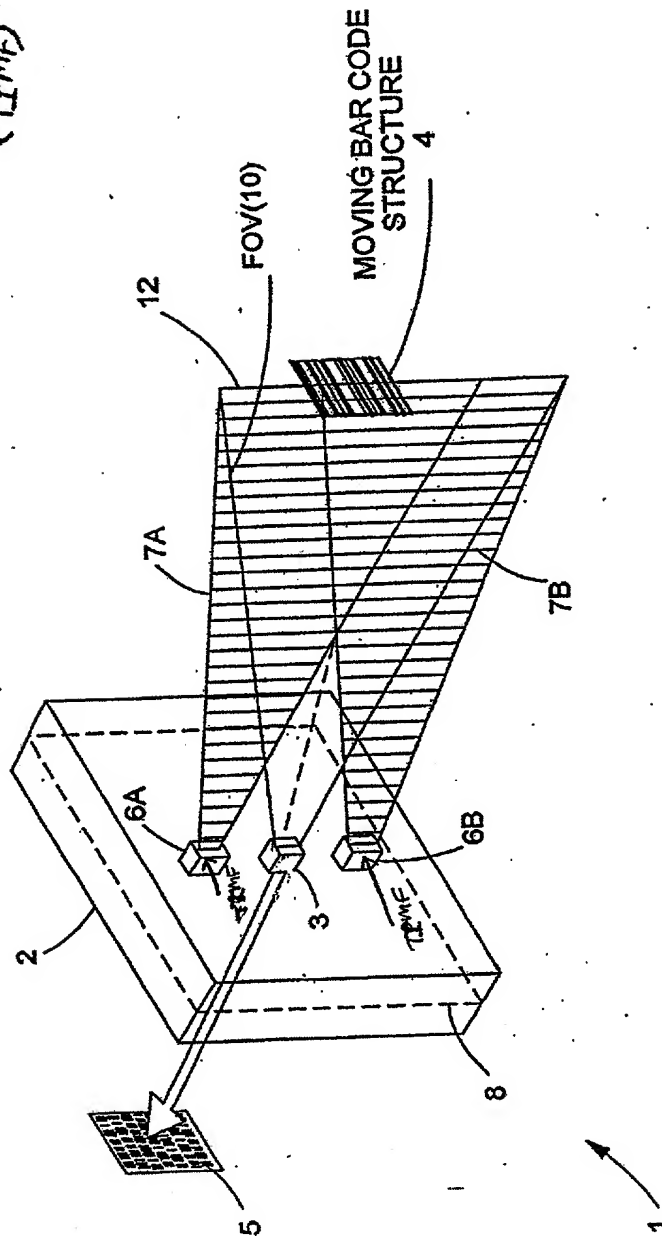


FIG. 1116

50/ 385

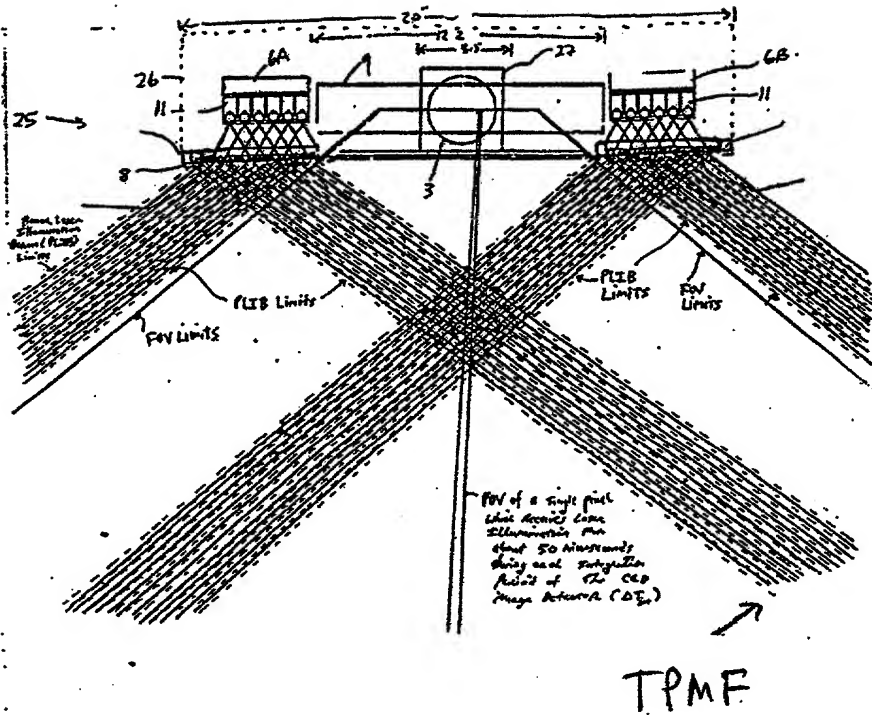


FIG. 1 I 16A



51/ 385

Third Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal *phase* of the transmitted PLIB along the ~~planar extent thereof~~ according to a *temporal phase* modulation function (TPMF) so as to:

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG. 1I/6B

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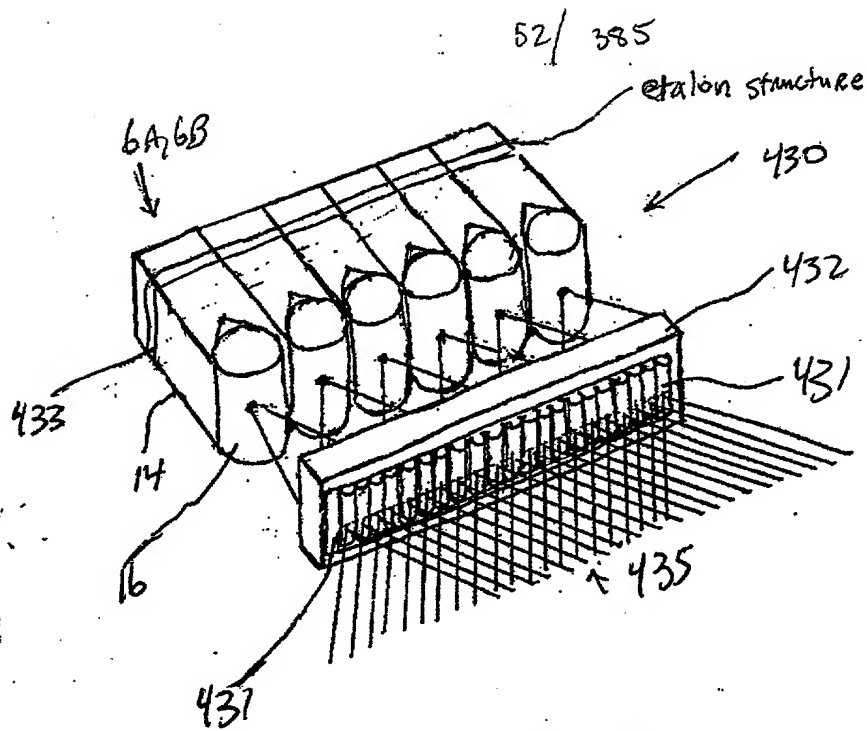


FIG. 1I17A

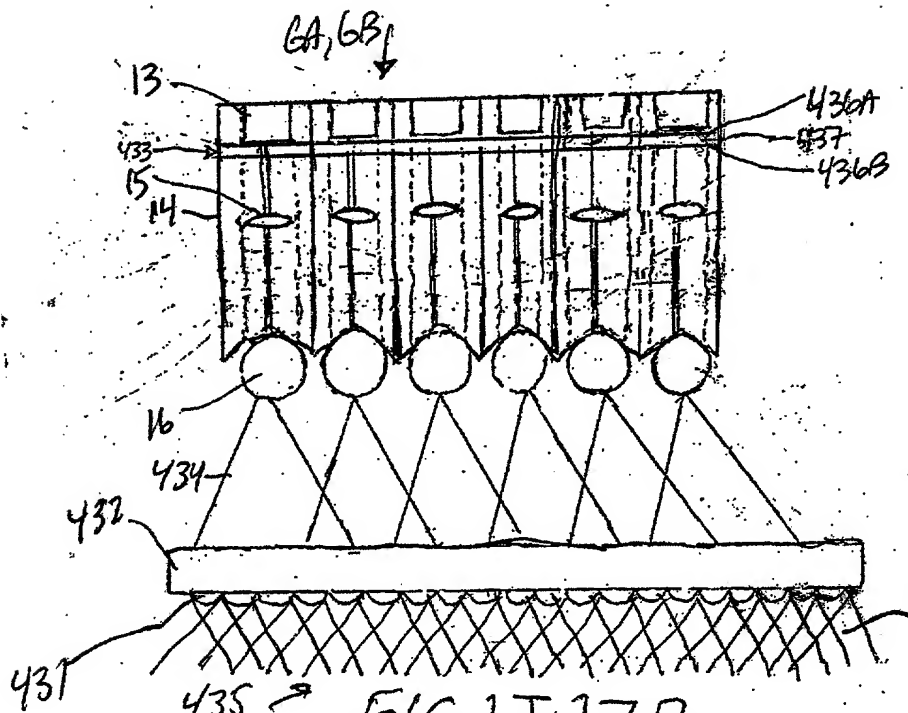
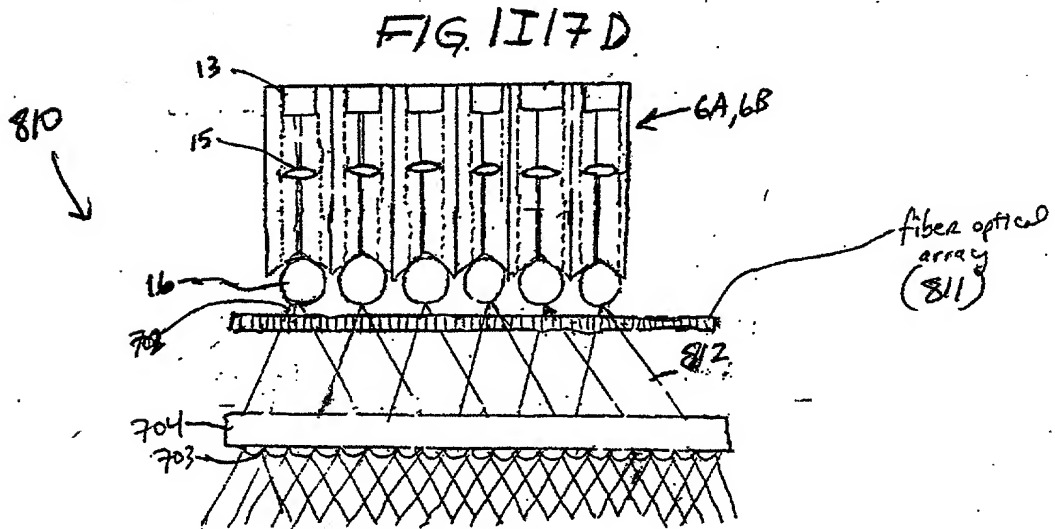
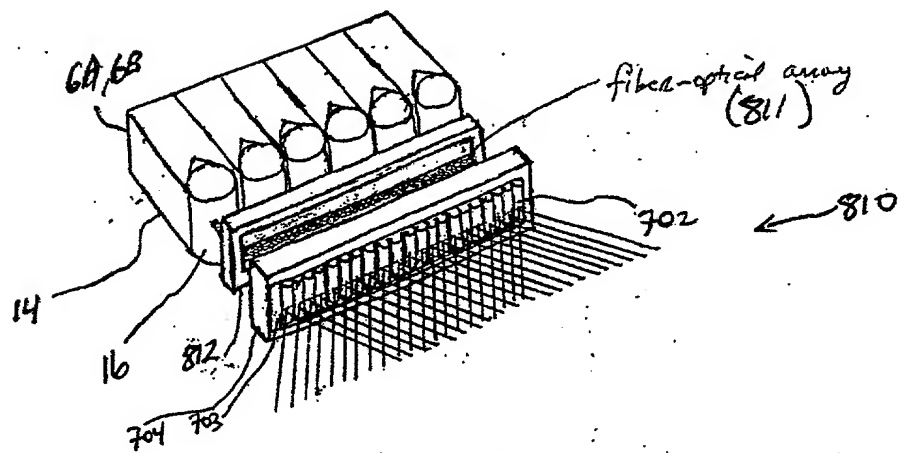
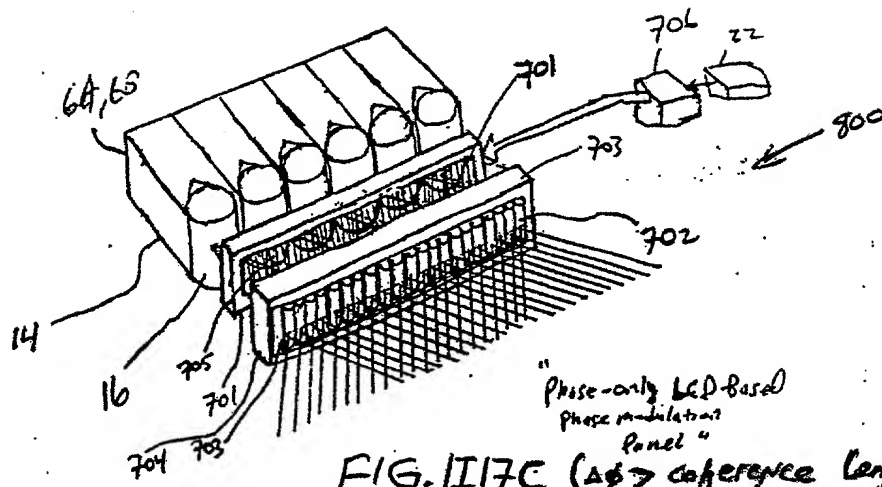


FIG. 1I17B

53/ 385



10058462, 020702

54/ 385

Fourth Generalized Method of  
Reducing Sparkle-Noise Patterns  
at Image Detection Array  
of the FFD Subsystem (3)

(TFMP)

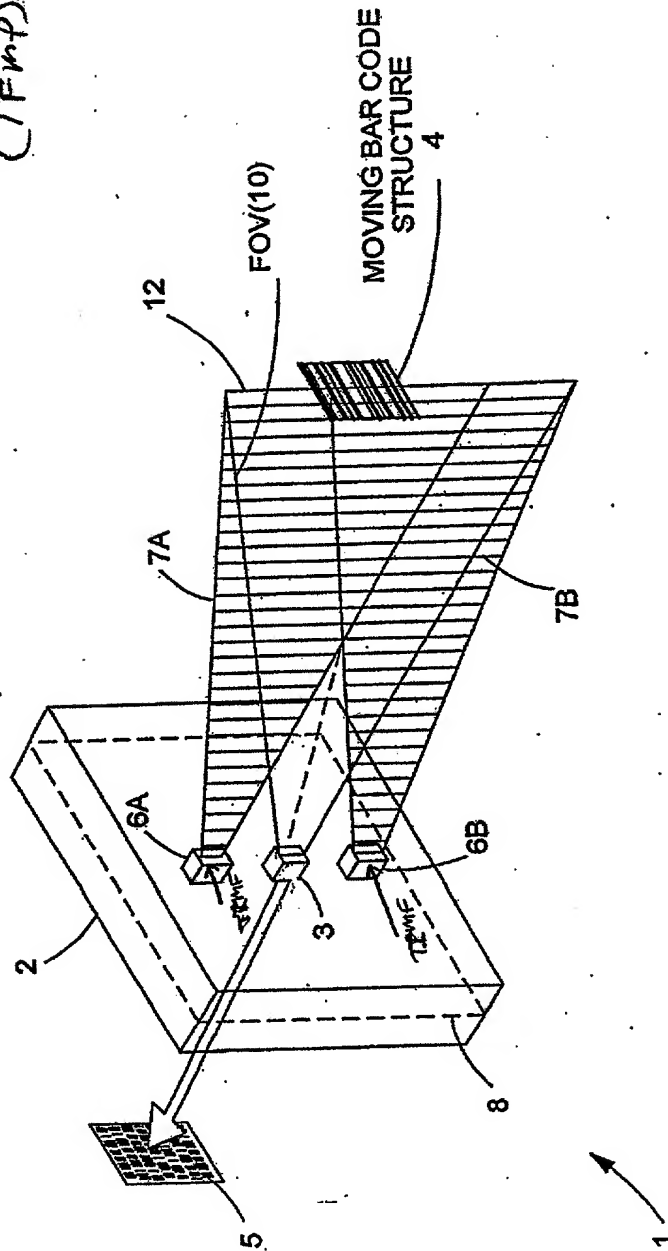
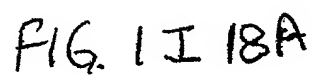


FIG. 1118

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56/ 385

Fourth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal frequency of the transmitted PLIB according to a temporal intensity modulation function (T IMF) so as to

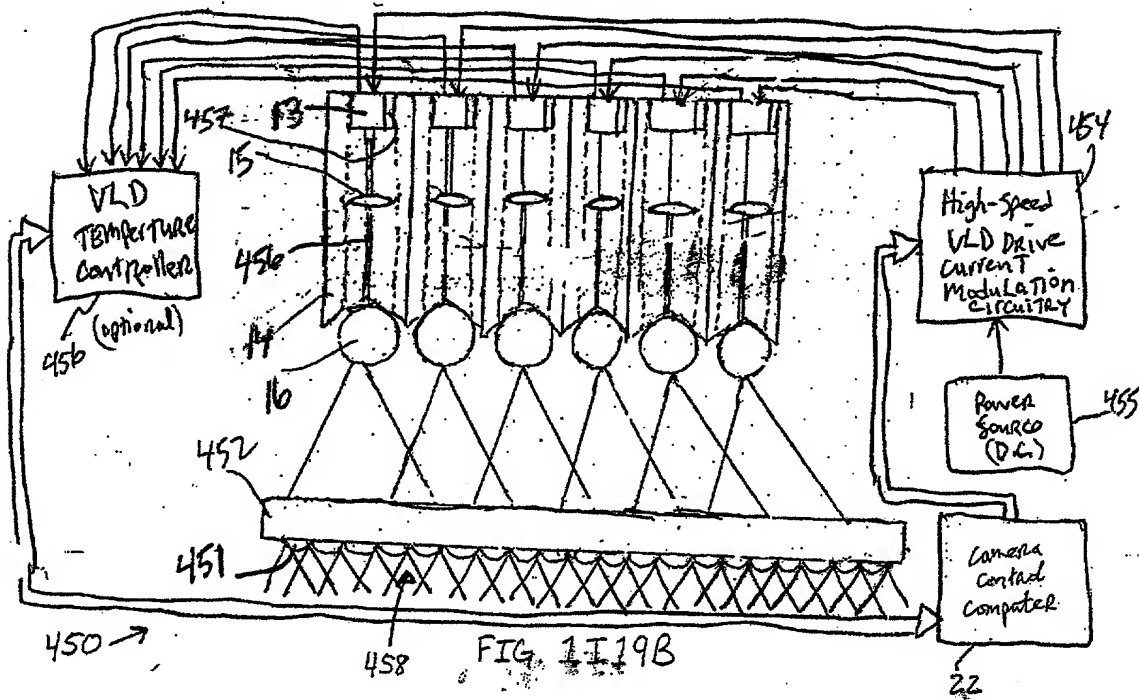
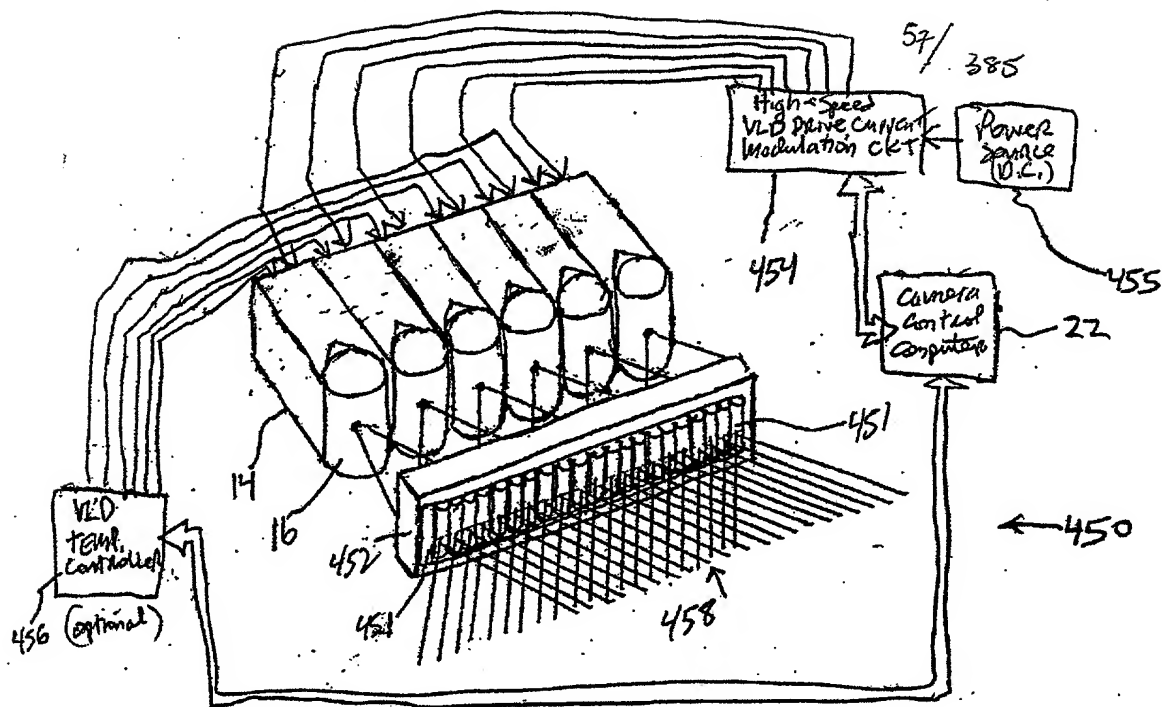
produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

FIG 1I18B

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58/385

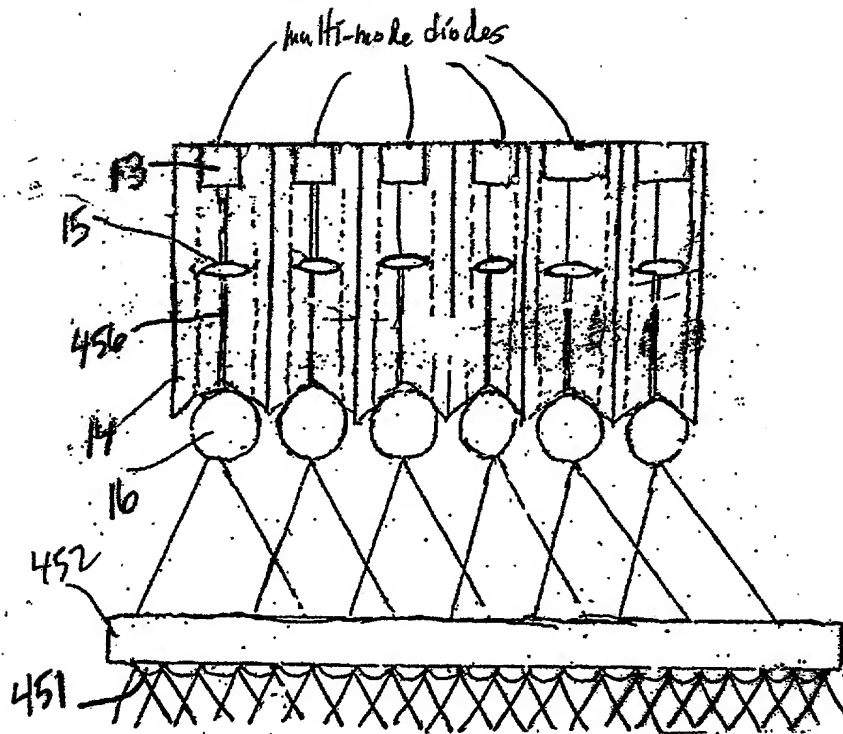


FIG 1I19C

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59/ 385

Fifth Generalized Method  
of Reducing Speckle-Noise  
Patterns AT Image  
Detection array of the  
FPD Subsystem (3)

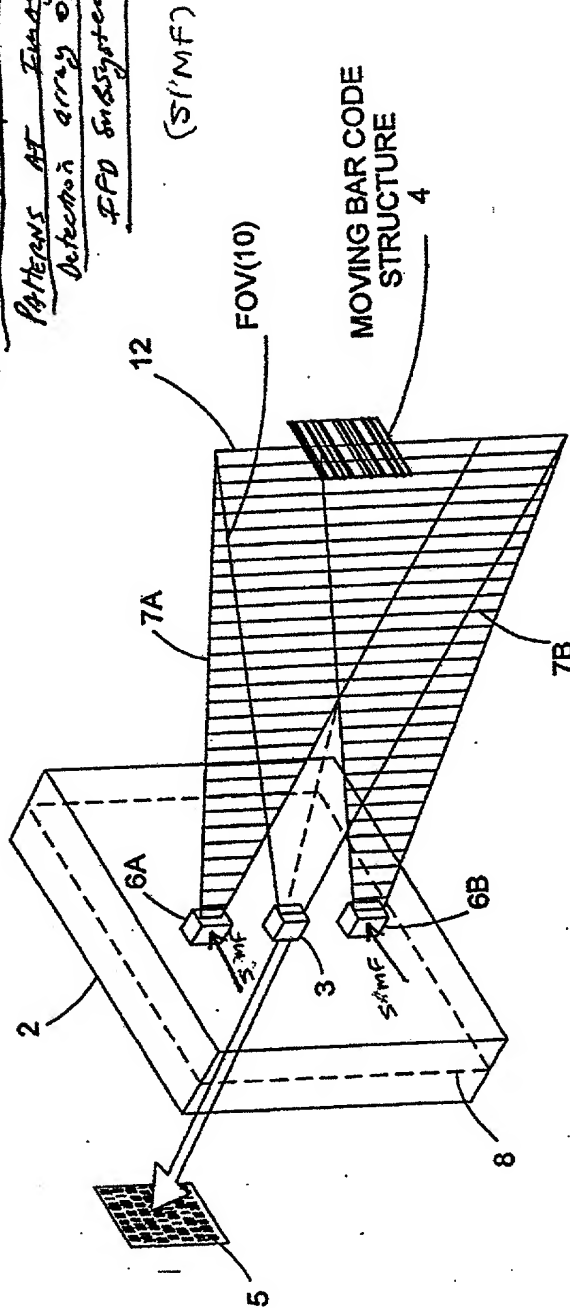


FIG 1F 20

60 / 385

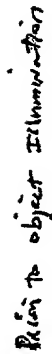


FIG. 11 ZOA

61/ 385

Fifth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

Prior to illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the transmitted PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to :

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

A

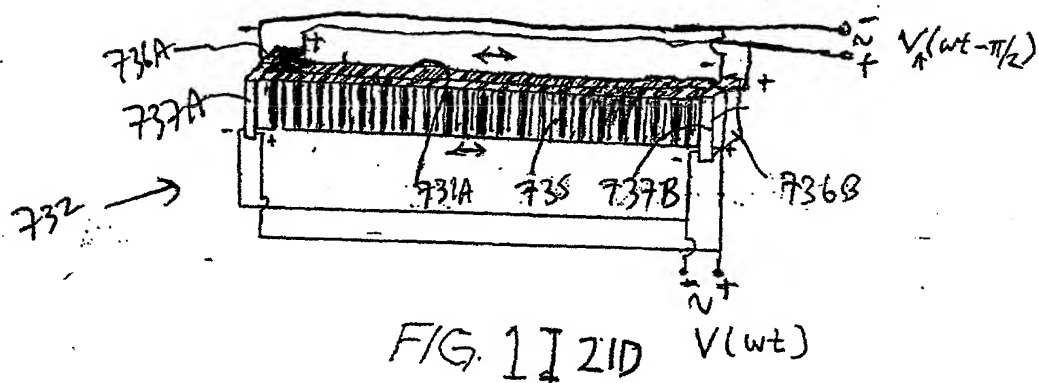
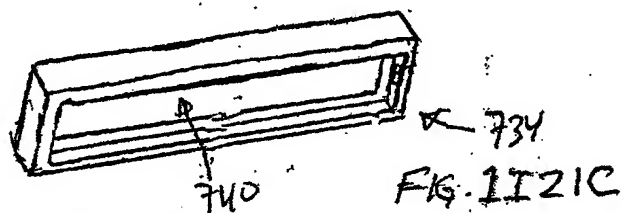
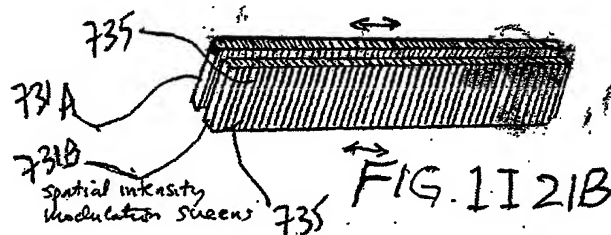
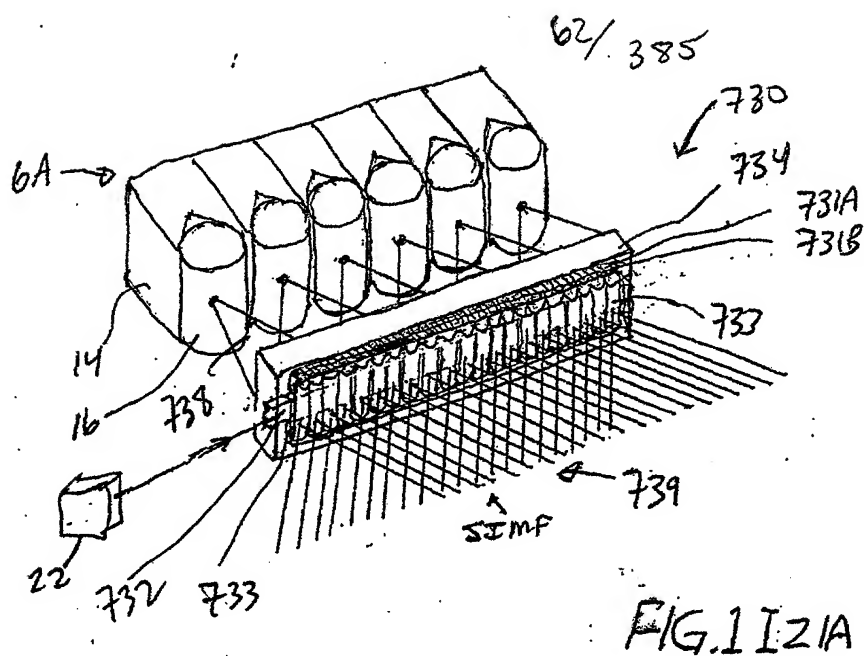
↓  
Temporally average the numerous substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce power of the speckle-noise pattern observed at the image detection array.

B

FIG. 1I20B

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Generalized Method of  
Reducing Speckle-Noise Patterns  
at Image Detection array  
of the ICD Subsystem

(SIMF)

63/ 385

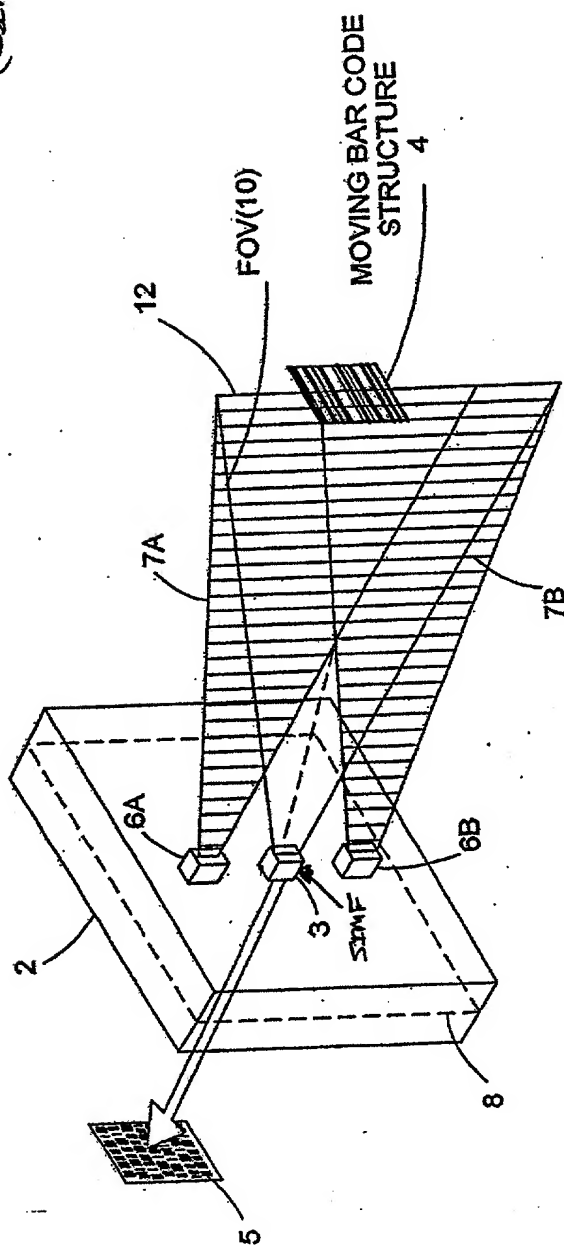


FIG. 1I 22

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64/385

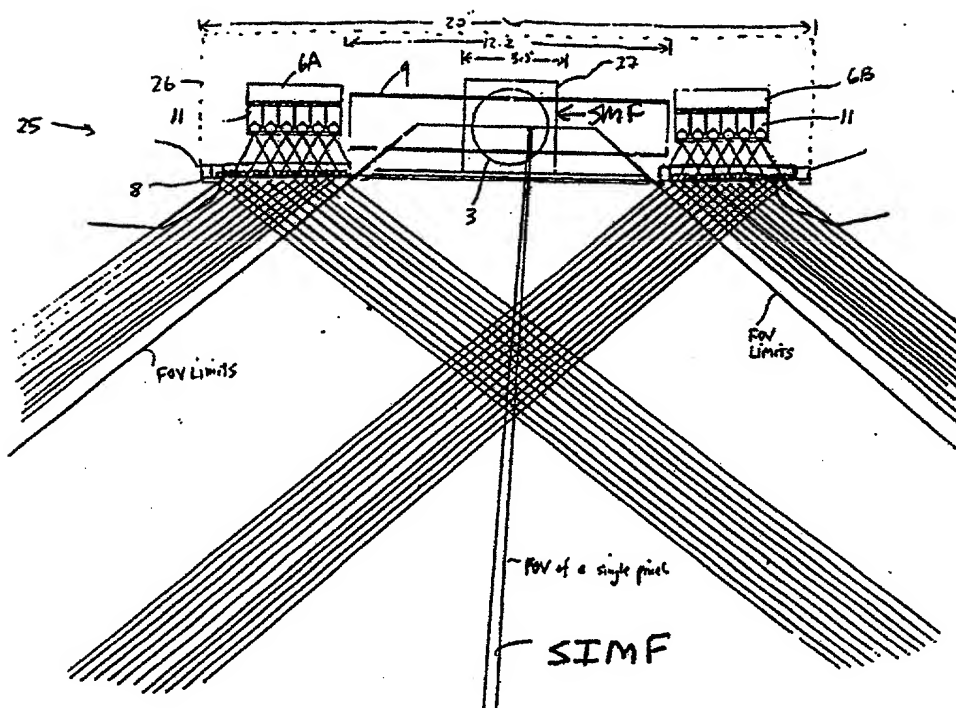


FIG. 1I 22A

65/ 395

Sixth Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

After illumination of the target with the planar laser illumination beam (PLIB), modulate the spatial intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a spatial intensity modulation function (SIMF) so as to :

produce numerous substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 22B

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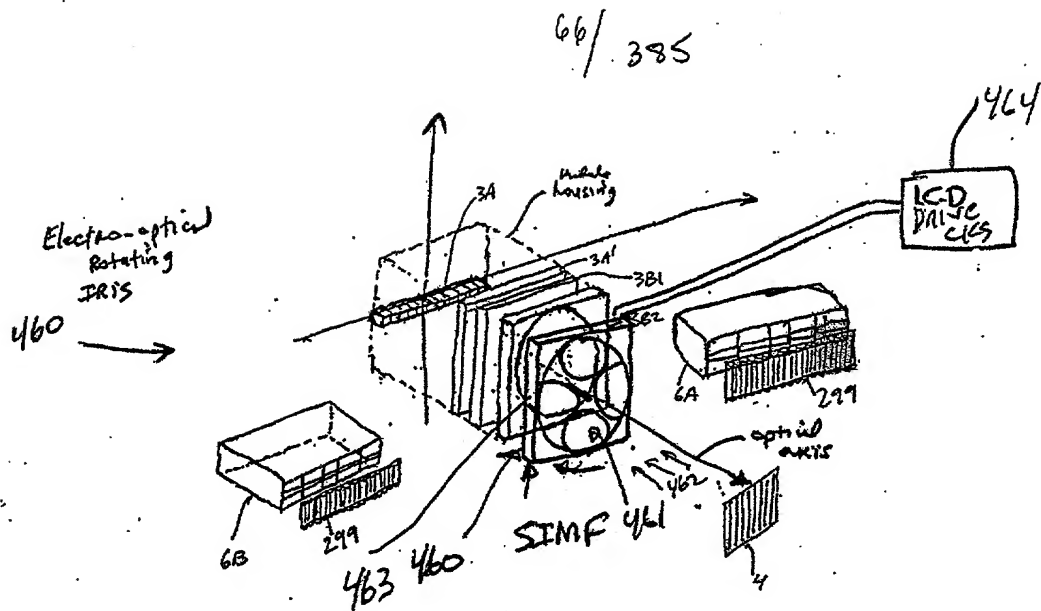


FIG. 1I 23A

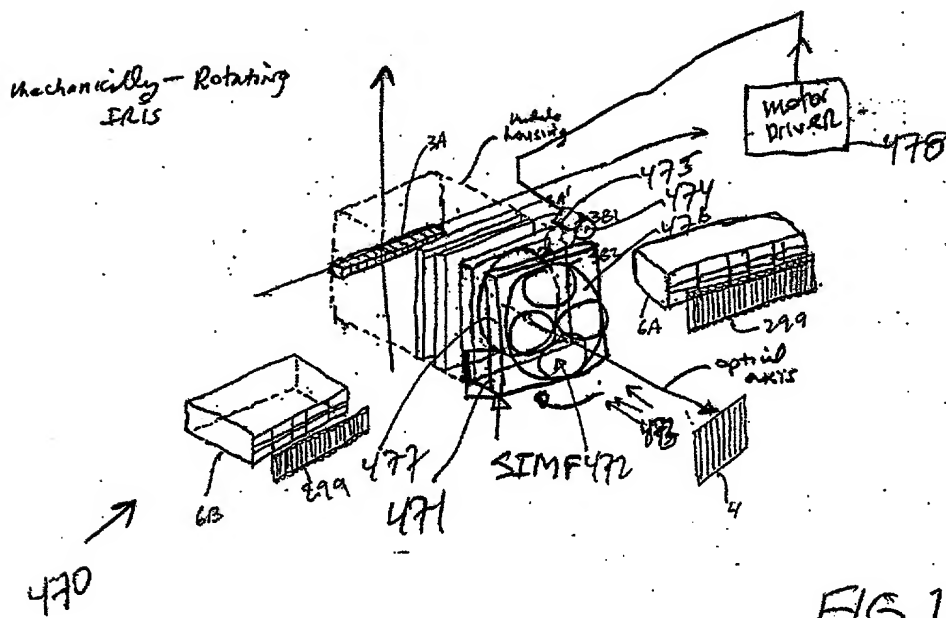


FIG. 1I 23B



Seventh Generalized Method of  
Reducing Speckle-Noise Patterns  
at Image Detection Array  
of the IPD Subsystem

(TIME)

67/ 385

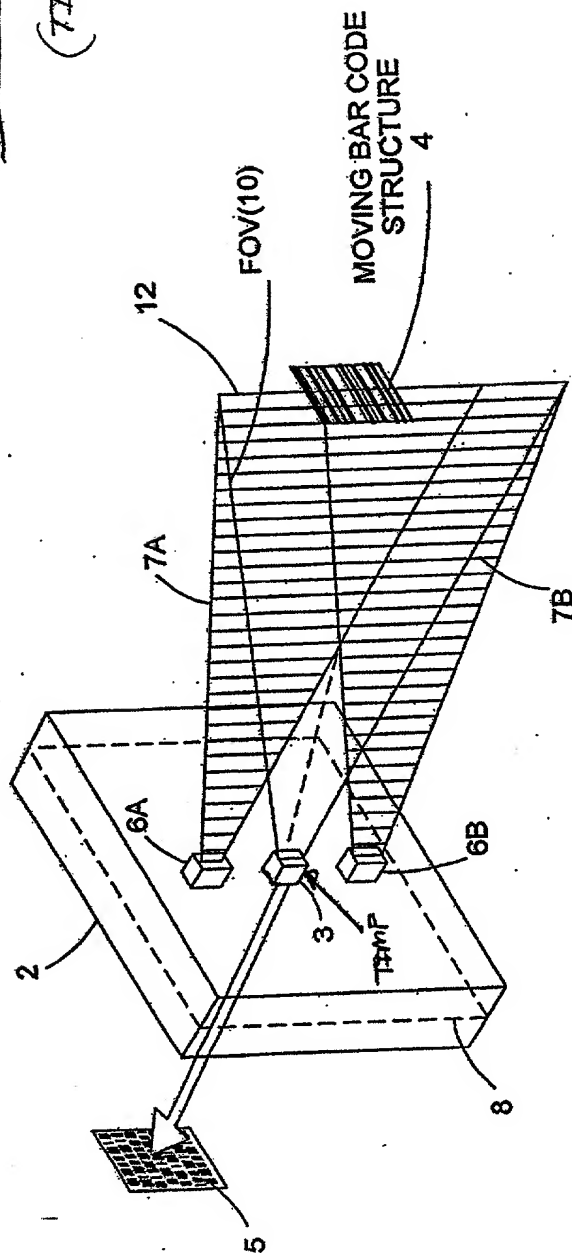


FIG. 11.24

68/ 385

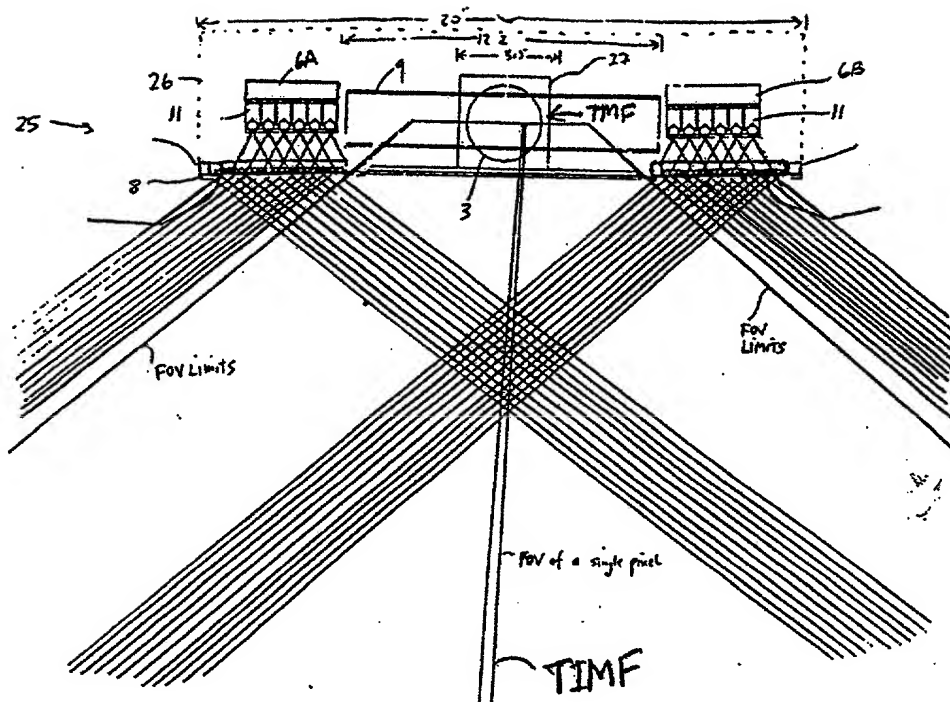


FIG. 1I24A

69/ 395

Seventh Generalized Speckle-Noise Pattern Reduction Method  
Of The Present Invention

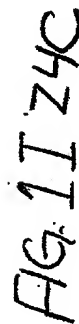
After illumination of the target with the planar laser illumination beam (PLIB), modulate the temporal intensity of the reflected/scattered (i.e. received) PLIB along the planar extent thereof according to a temporal intensity modulation function (TIMF) so as to :

produce many substantially different time-varying speckle-noise patterns at the image detection array of the IFD Subsystem during the photo-integration time period thereof.

Temporally average the many substantially different time-varying speckle-noise patterns produced at the image detection array in the IFD Subsystem during the photo-integration time period thereof, so as to thereby reduce the speckle-noise pattern observed at the image detection array.

FIG. 1I 24B

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7/1/85

EIGHT GENERALIZED METHOD OF REDUCING THE SPECKLE PATTERN  
NOISE OBSERVED IN PLIIM-BASED IMAGING SYSTEMS

A

Use a PLIIM-BASED Imager to produce a series of consecutively captured digital images of an object over a series of photo-integration time periods of the PLIIM-Based Imager, wherein each digital image of the object includes a substantially different speckle noise pattern produced by natural oscillatory micro-motion and/or forced oscillatory micro-movement of the Imager relative to the object during operation of the PLIIM-Based Imager.

B

Store the series of consecutively captured digital images of the object in buffer memory within the PLIIM-Based Imager.

C

Add relatively small (e.g. 3x3) windowed image processing filters to the additively combine and average the pixel data in the series of consecutively captured digital images so as to produce a reconstructed digital image having a speckle noise pattern with reduced RMS power.

FIG. 1124D

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72/385

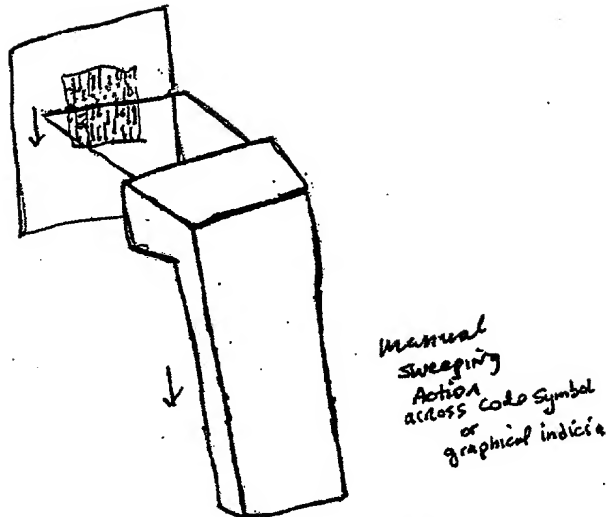


FIG. 1I24E

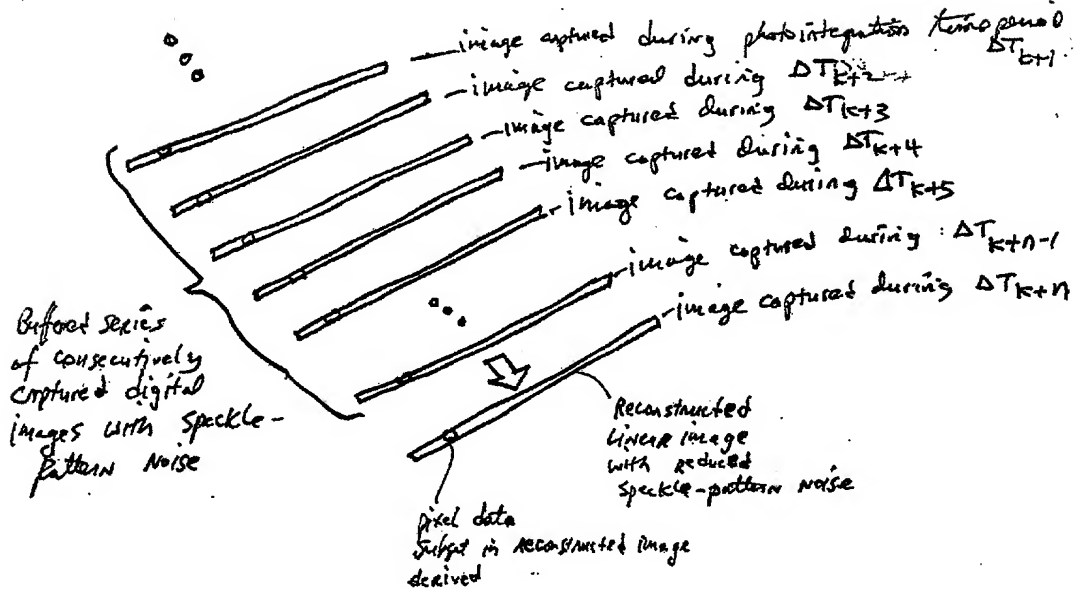


FIG. 1I24F

Case: Linear Image

10058462, 020702

73/ 385

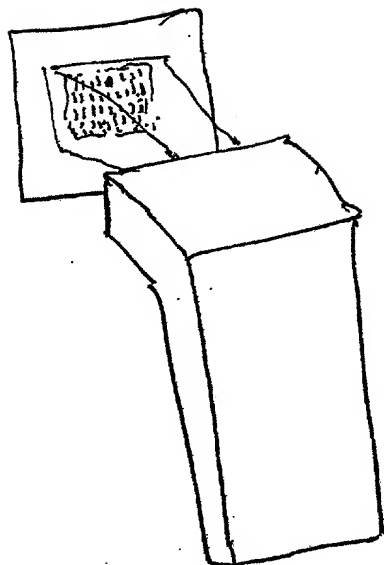


FIG. 1I24G

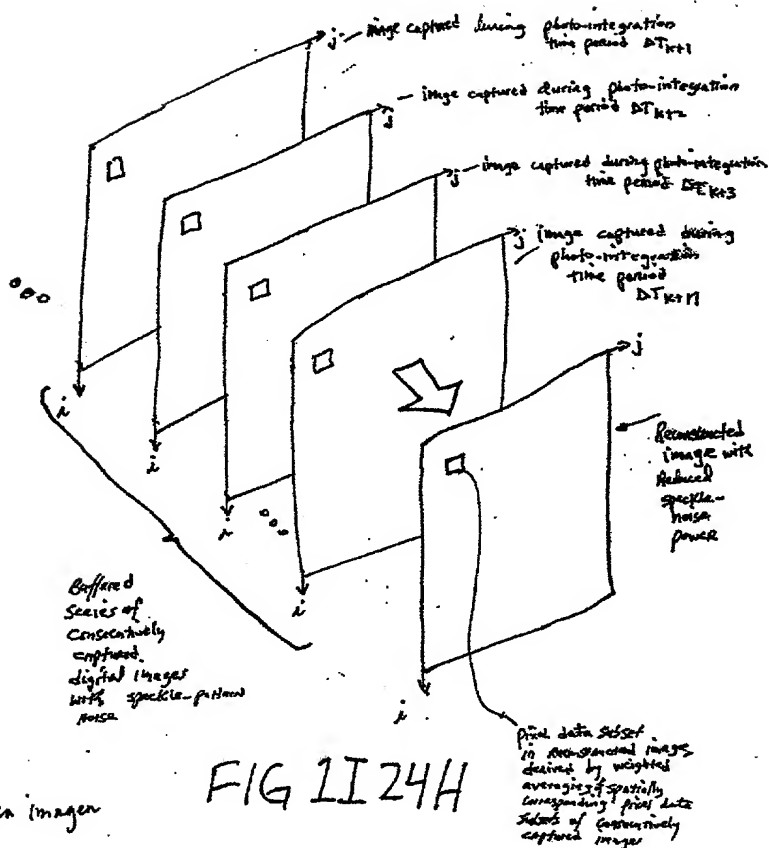


FIG 1I24H

Case: 2D Area Imager

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74/385

NINTH GENERALIZED METHOD OF REDUCING SPECKLE PATTERN  
NOISE IN PLIIM-BASED IMAGING SYSTEMS

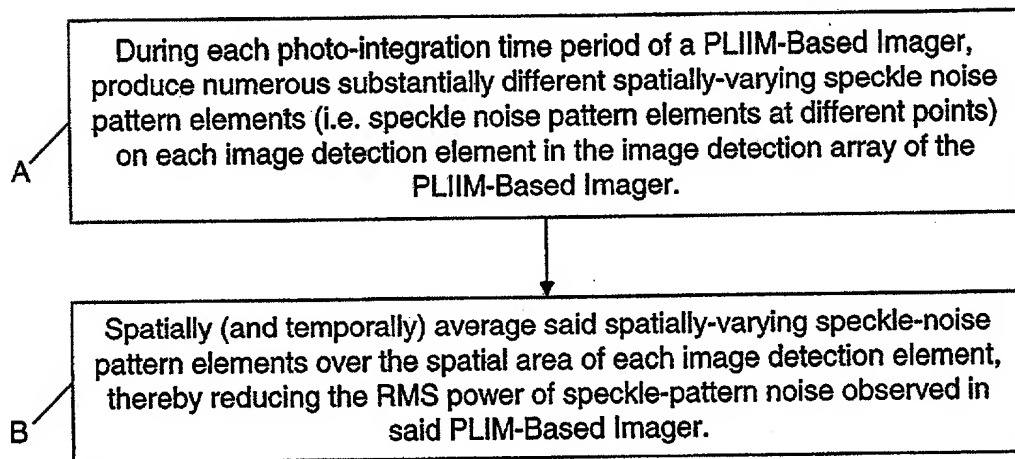


FIG. 1124I



FIG. 1I25A1

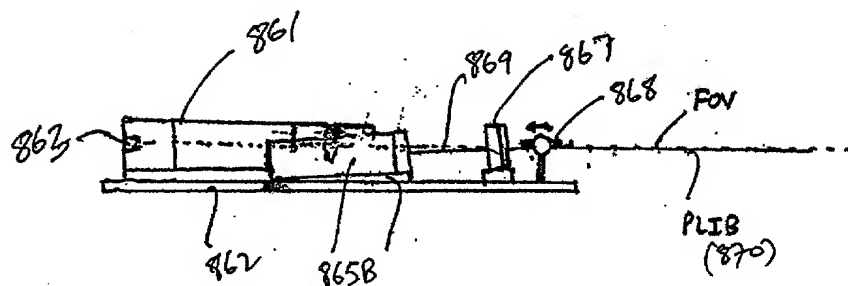
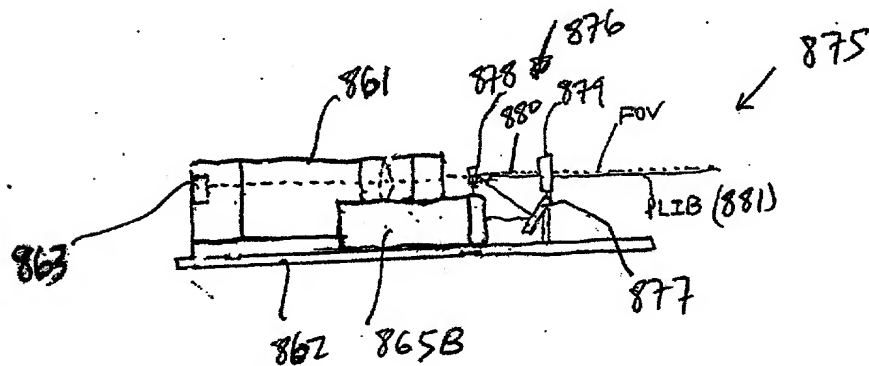
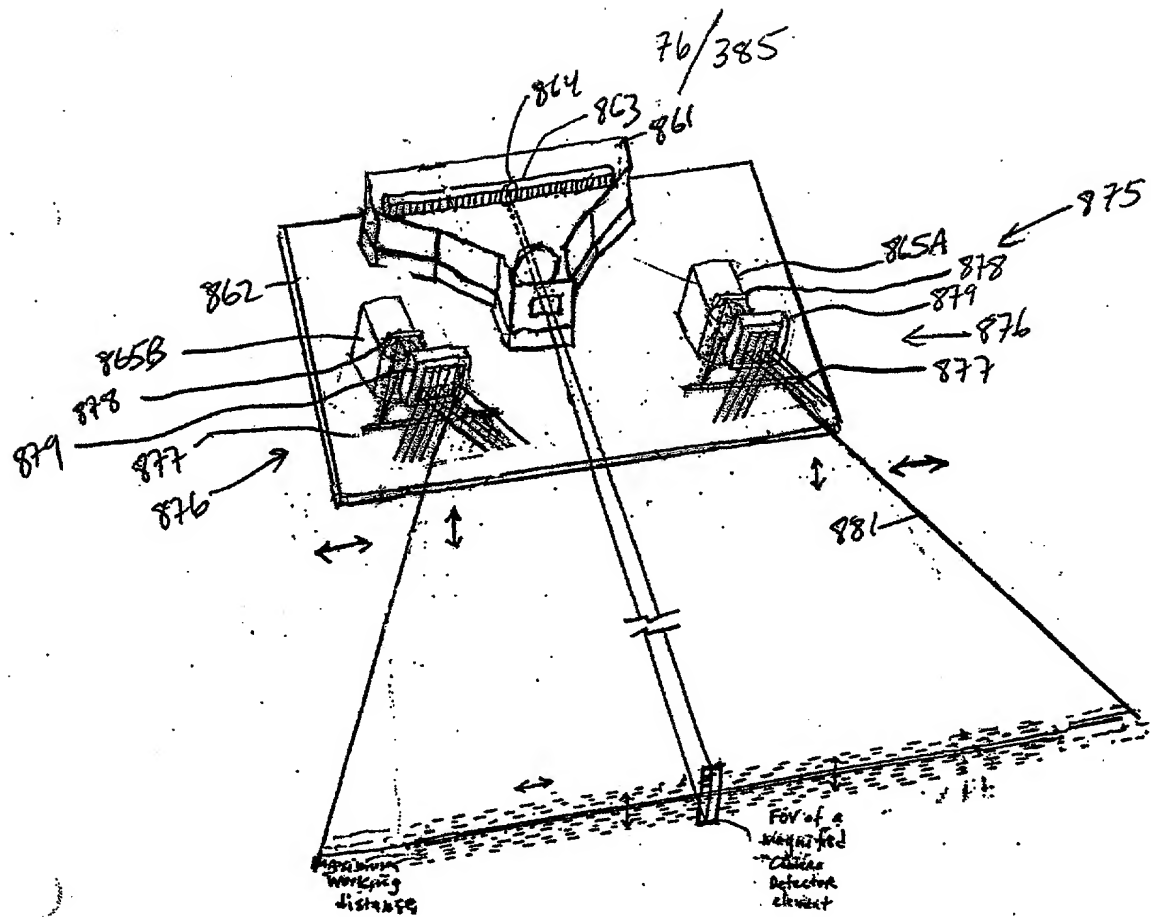


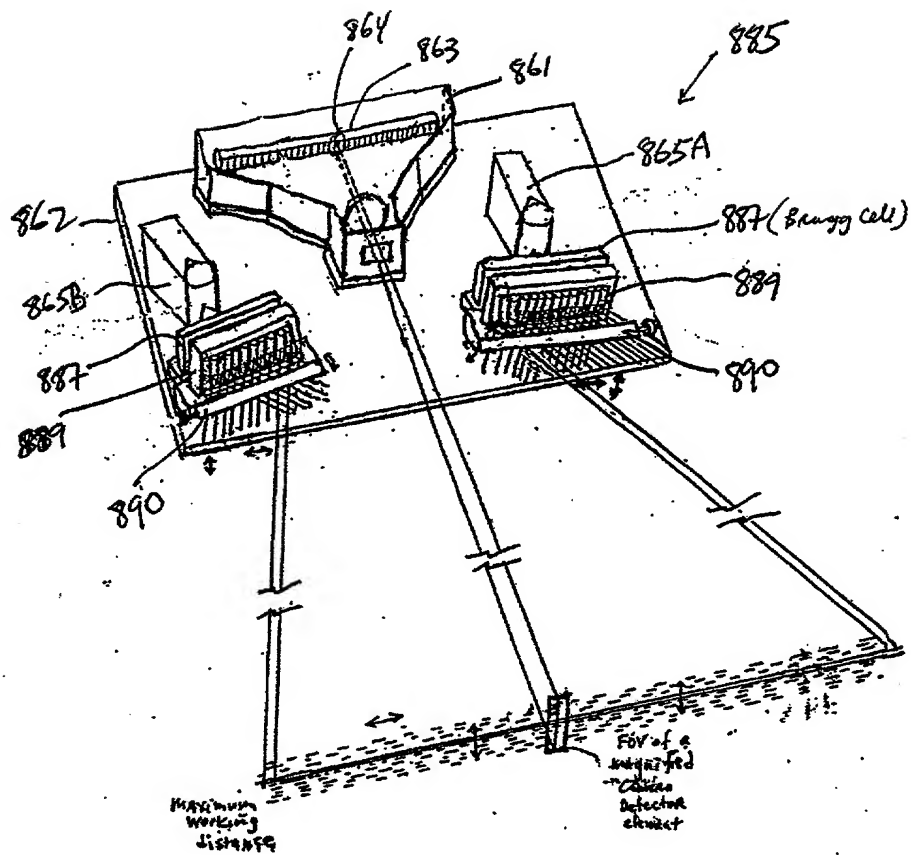
FIG. 1I25A2

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77/385



\* Lateral and Transverse Microscillation of PLIB

FIG. 1I25C1

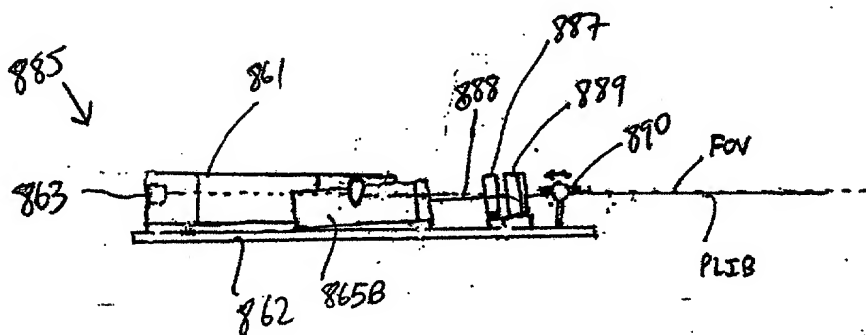
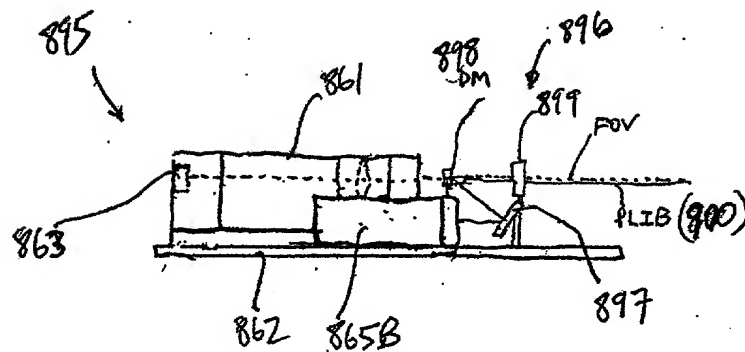
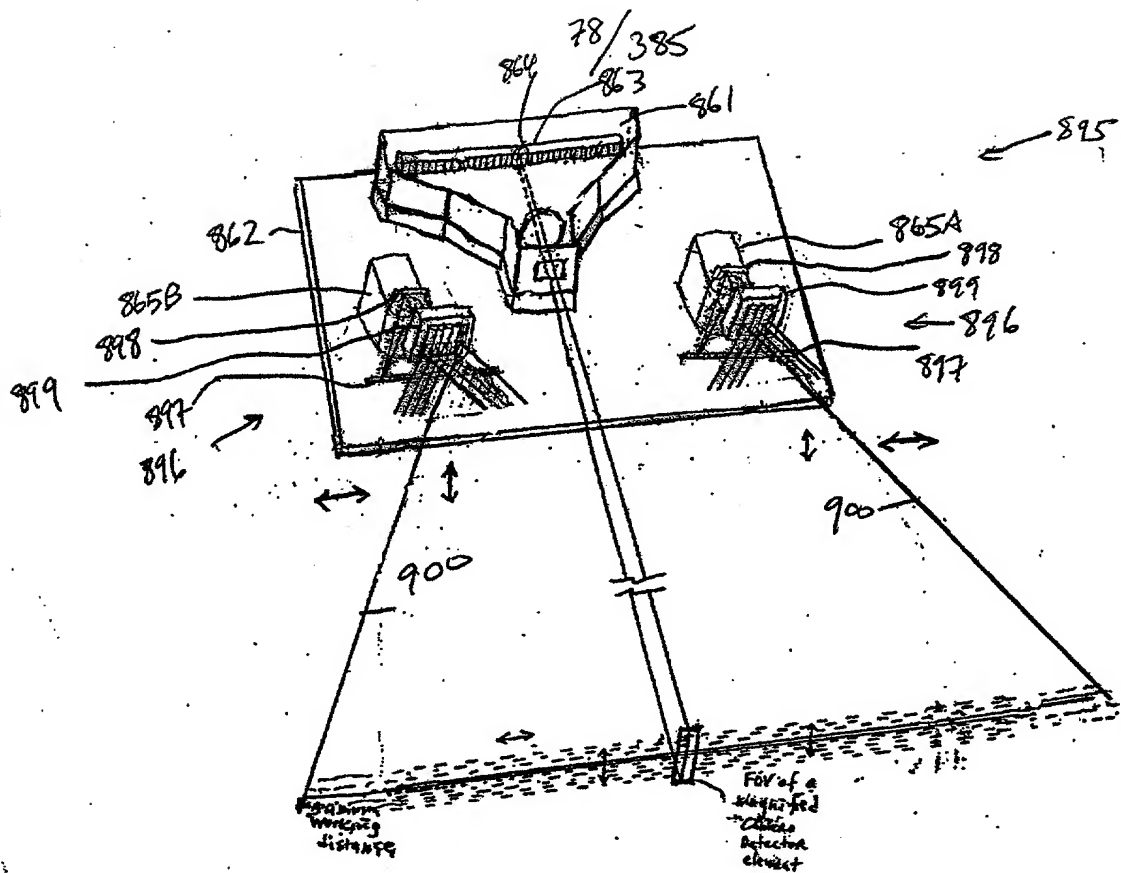


FIG. 1I25C2

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79/385

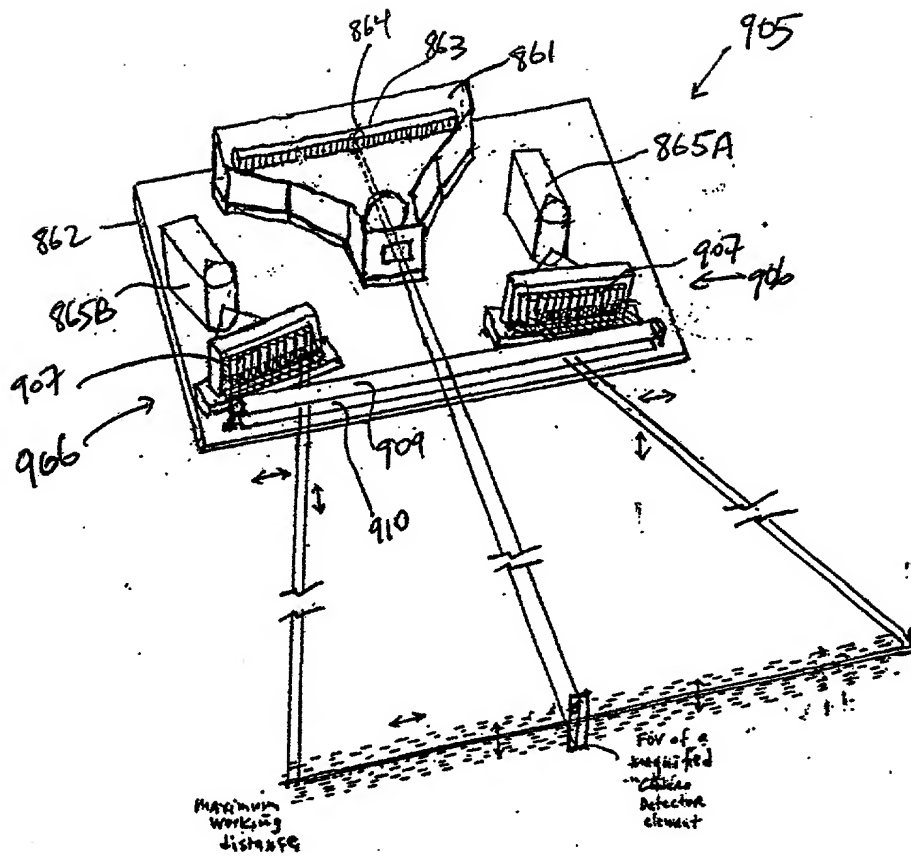


FIG. 1I25E1

\* Lateral and Transverse Microoscillation of PLIB

905

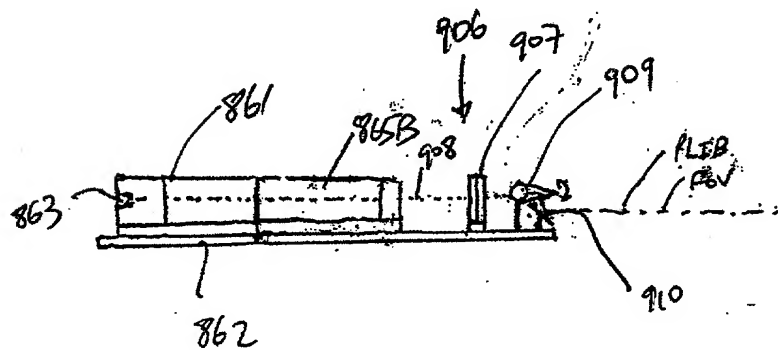


FIG. 1I25E2

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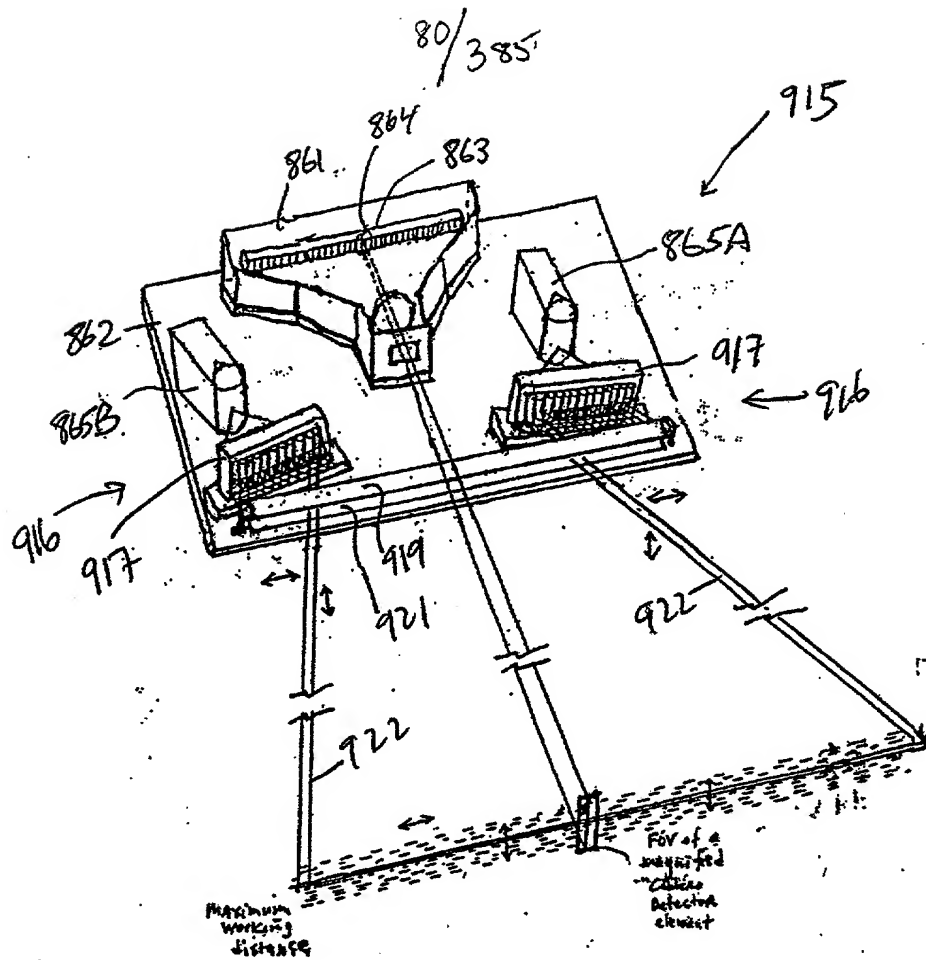


FIG. 1I25P1

- \* Lateral and Transverse Oscillation of ALIB

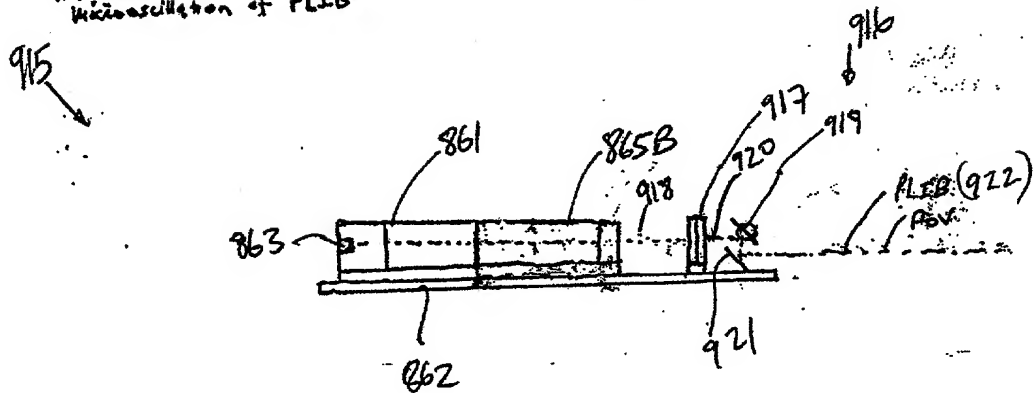


FIG. 1I 25 F2

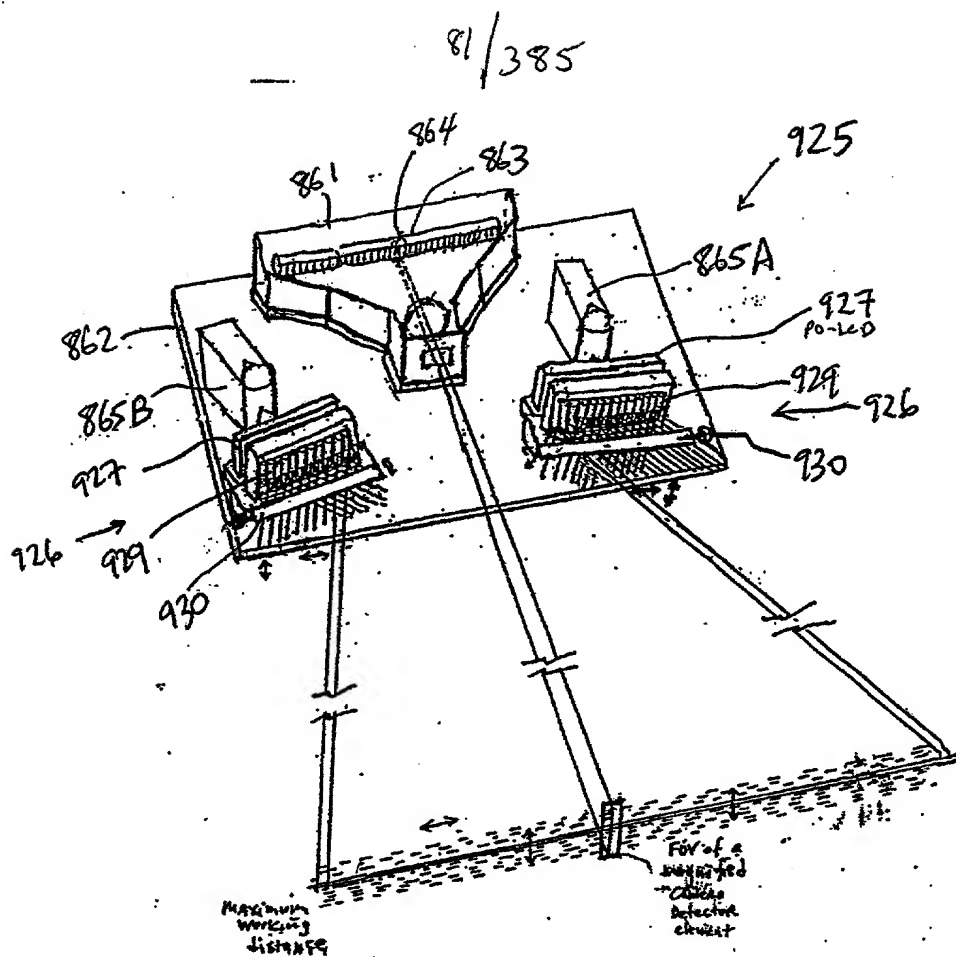


FIG. 1I25G1

\* Lateral and Transverse Misalignment of PLIB

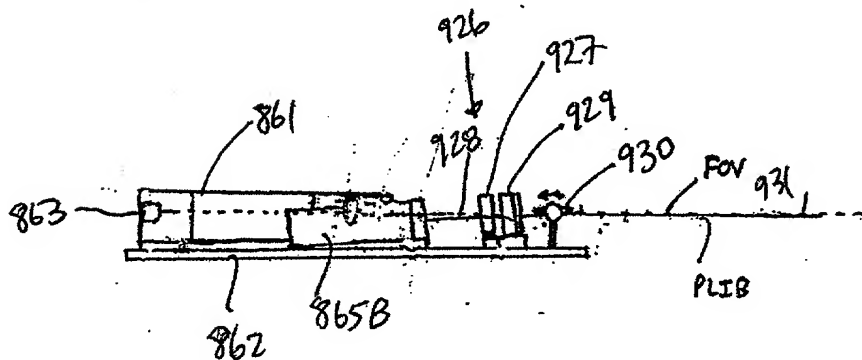
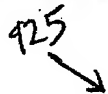
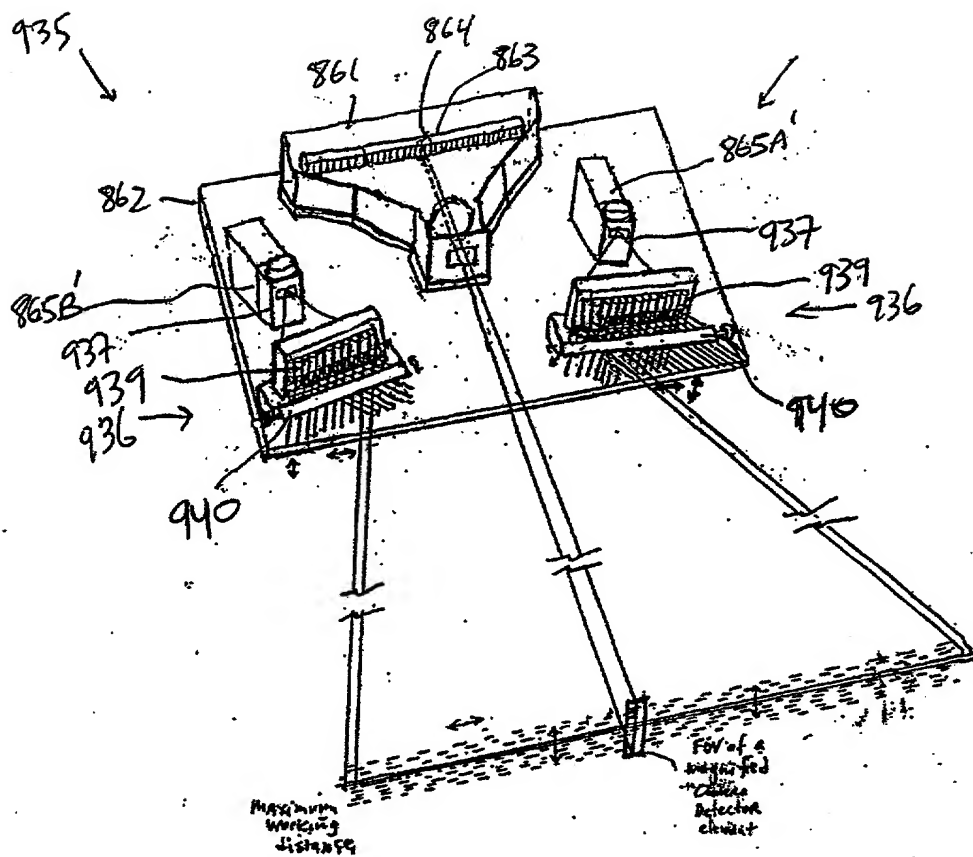


FIG. 1I25G2

82/375



\* Lateral and Transverse Oscillation of PLIB

FIG. 1I25H1

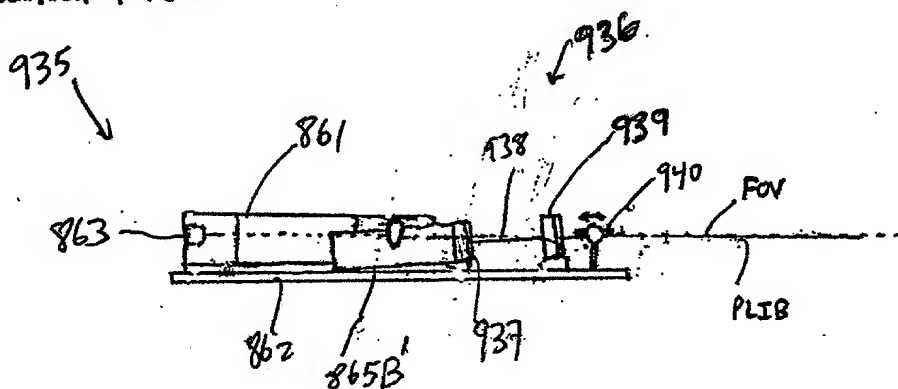
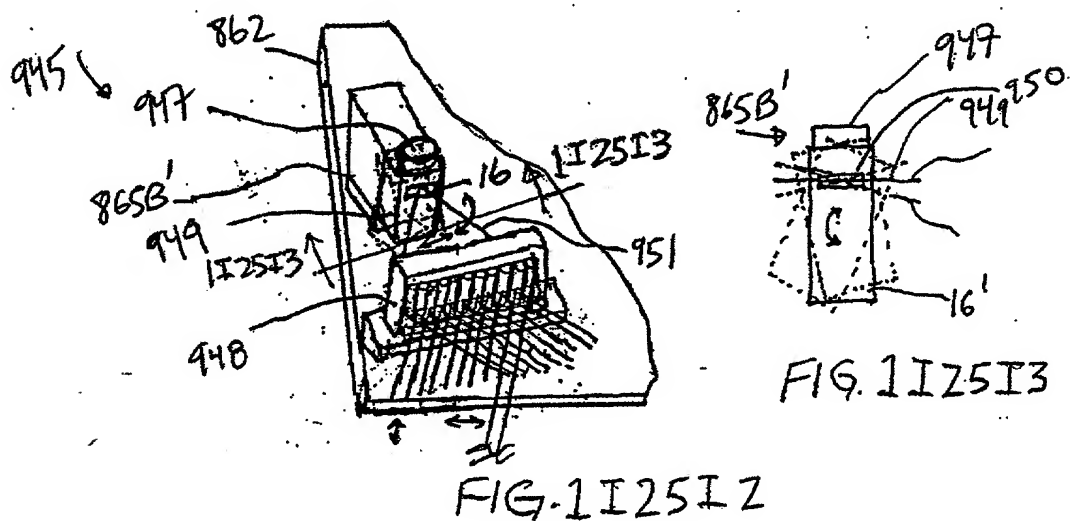


FIG. 1I25H2

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FIG. 1 I 25 I 1



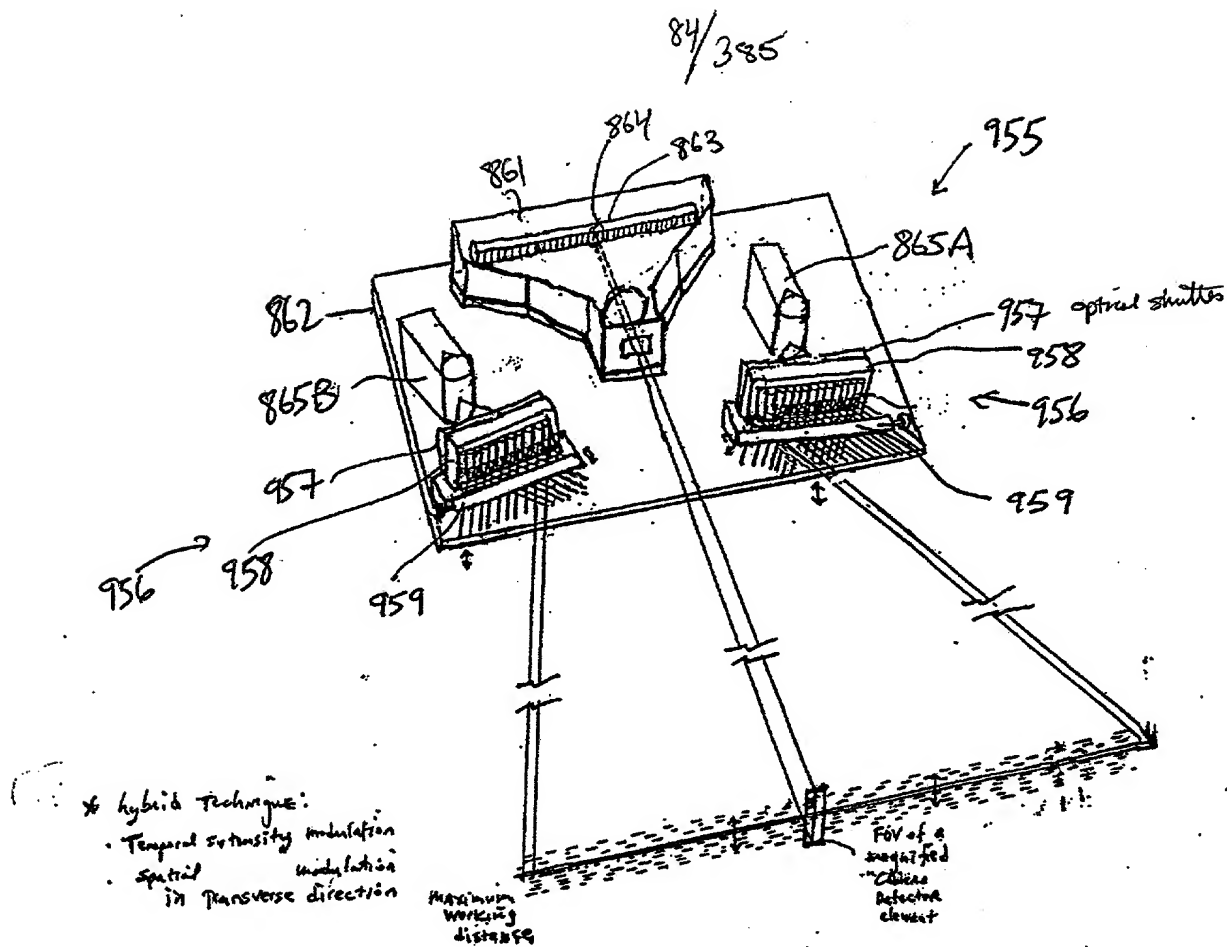


FIG. 1I25J1

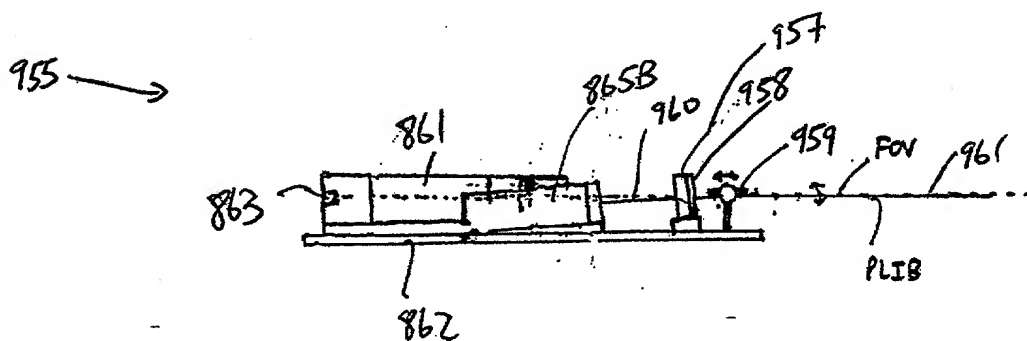


FIG. 1I25J2

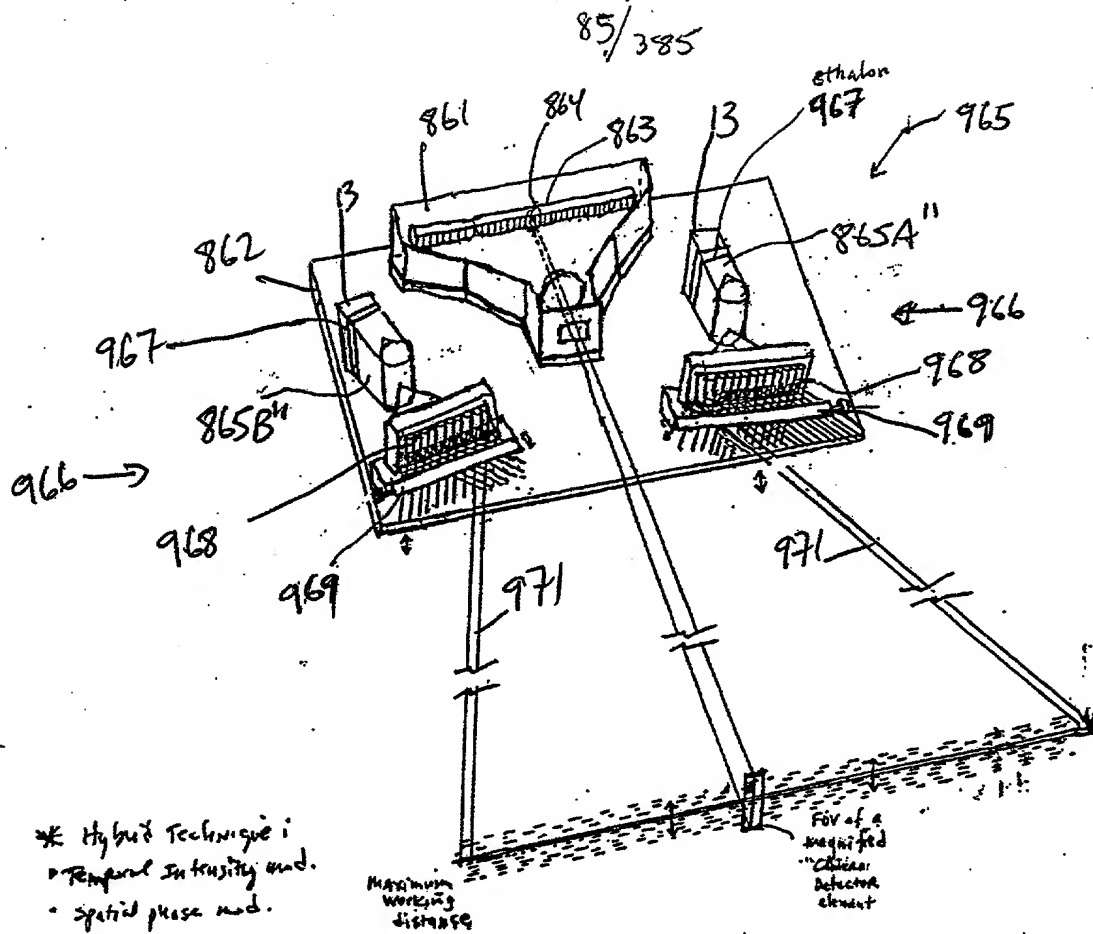


FIG. 1I25K1

\* Transverse Modulation of PLIB

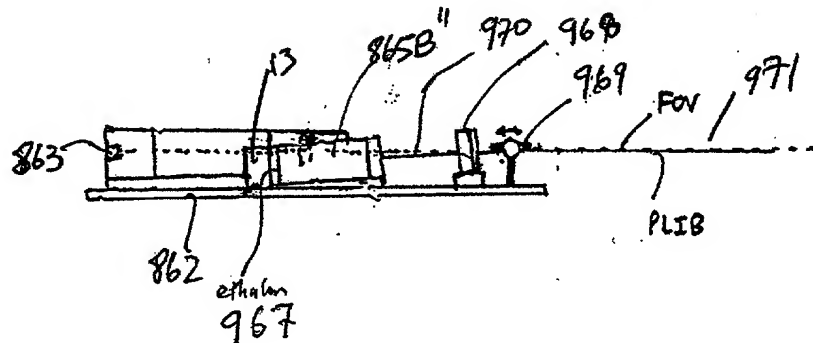
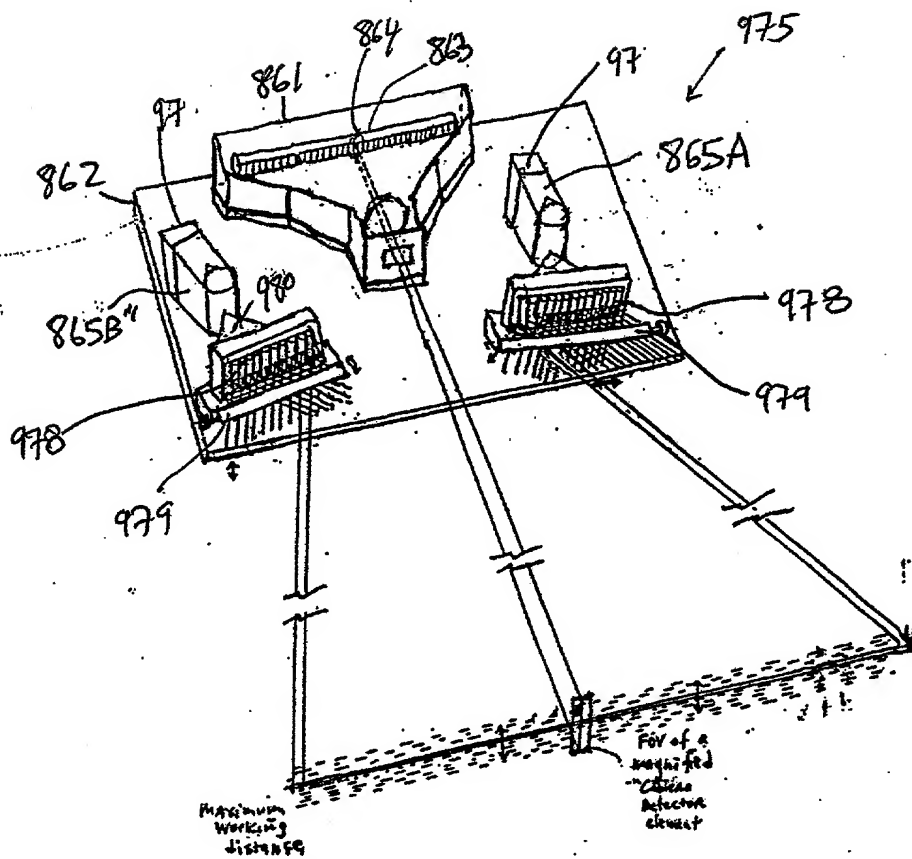


FIG. 1I25K2

86/385



- \* hybrid =
- Temp. freq. mod.
- Spatial phase mod.

\* Transverse  
cross-section of PLIB

FIG. 1I25L1

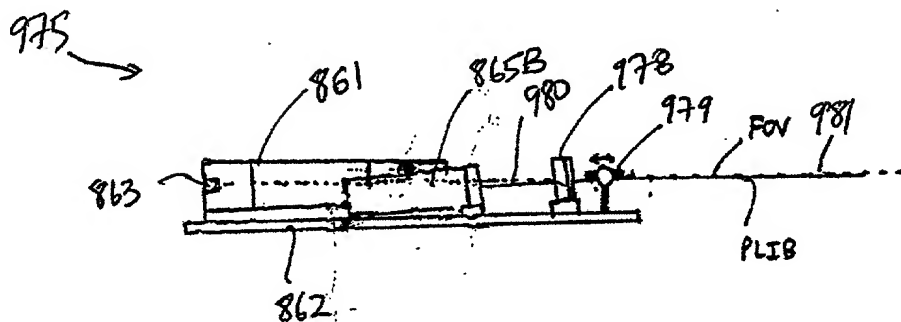


FIG. 1I25L2

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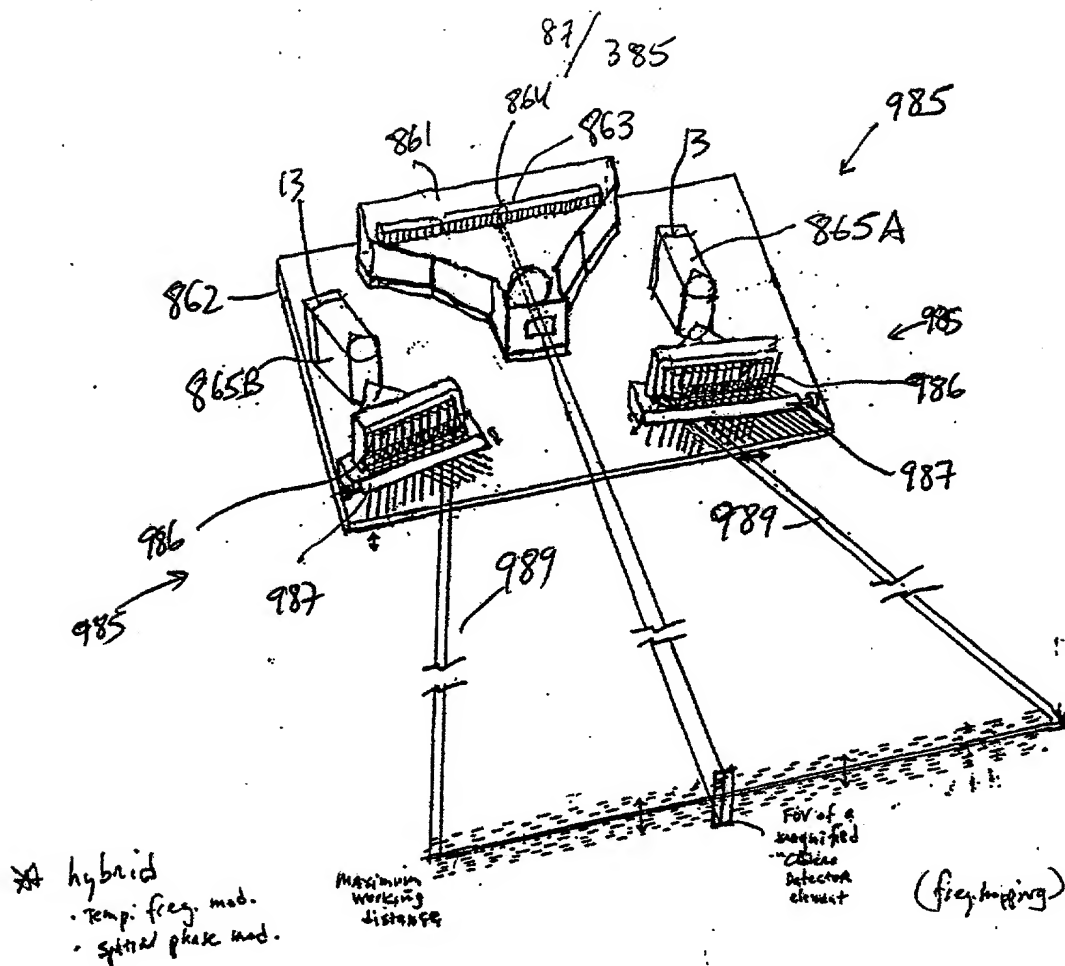


FIG. 1I25M1

\* Transverse  
 Modulation of PLB

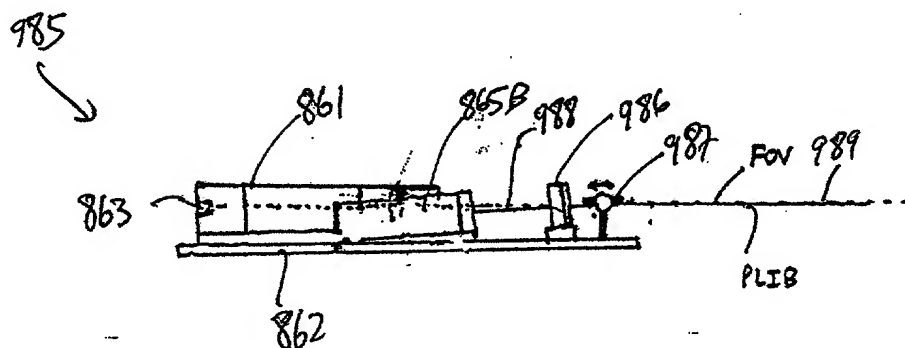
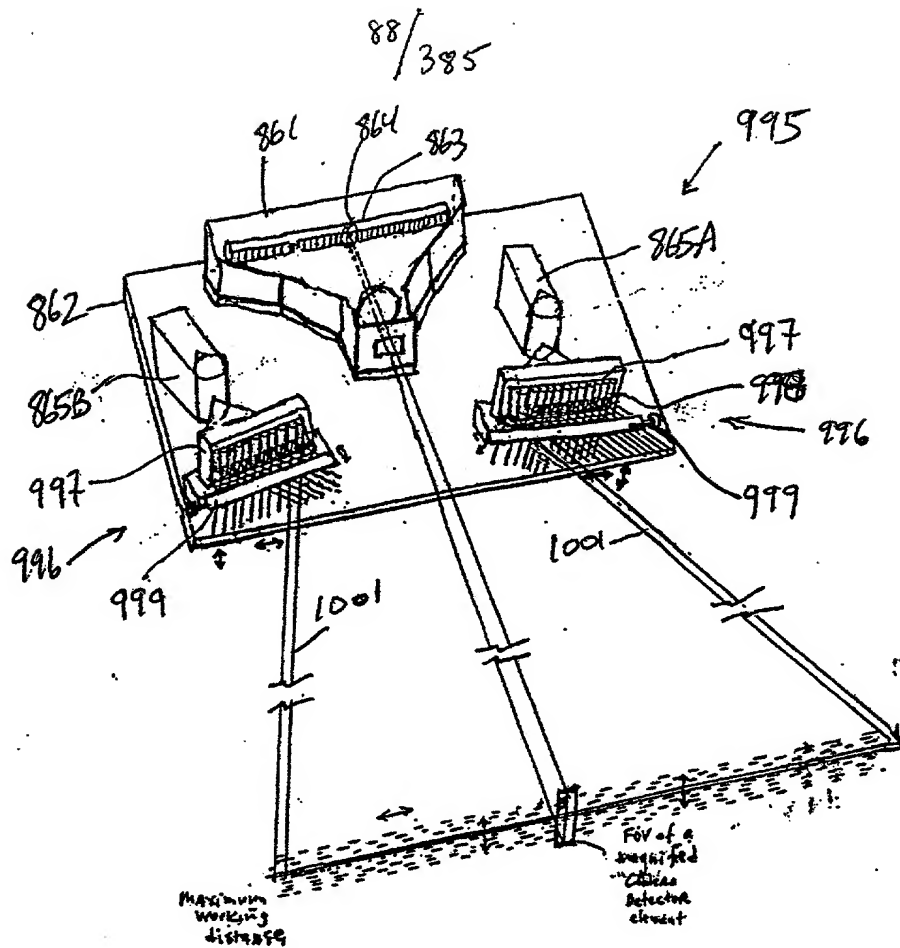


FIG. 1I25M2

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hybrid:

- spatial intensity mod.
- spatial phase

\* lateral and transverse modulation of PLIB

FIG. 1I25N1

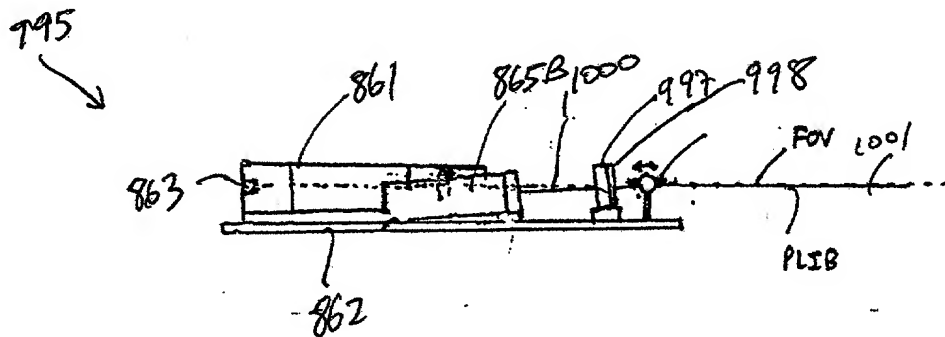


FIG. 1I25NZ

89/385

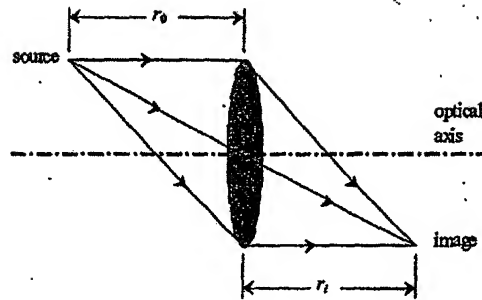


FIG. 1H1

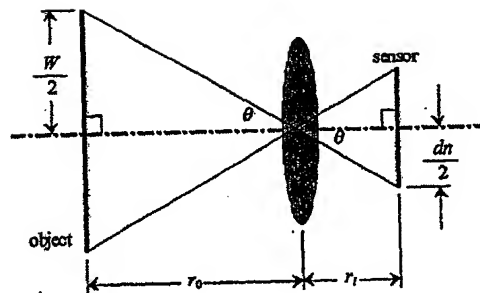


FIG. 1H2

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90/385

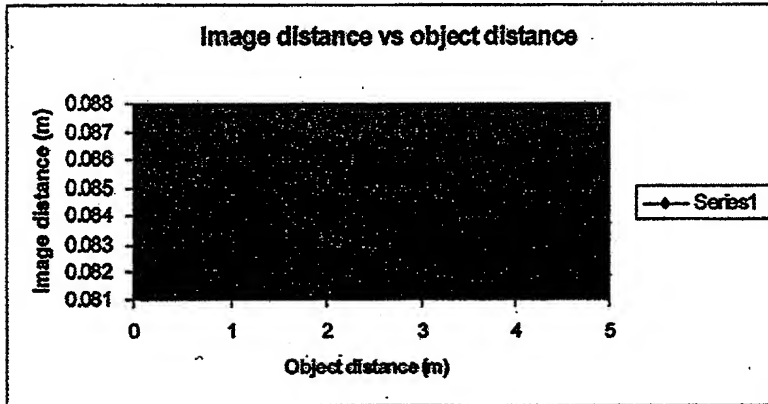


FIG. 1H3

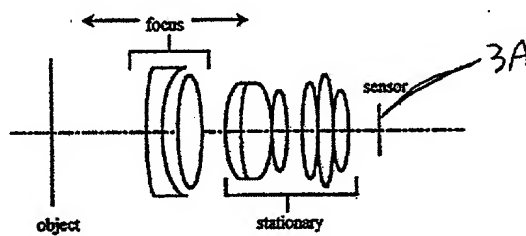


FIG. 1H4

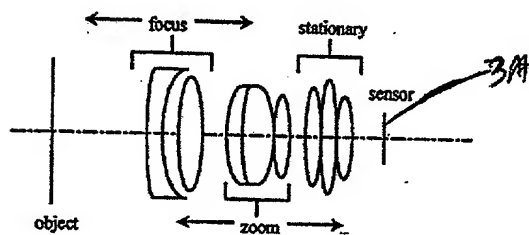


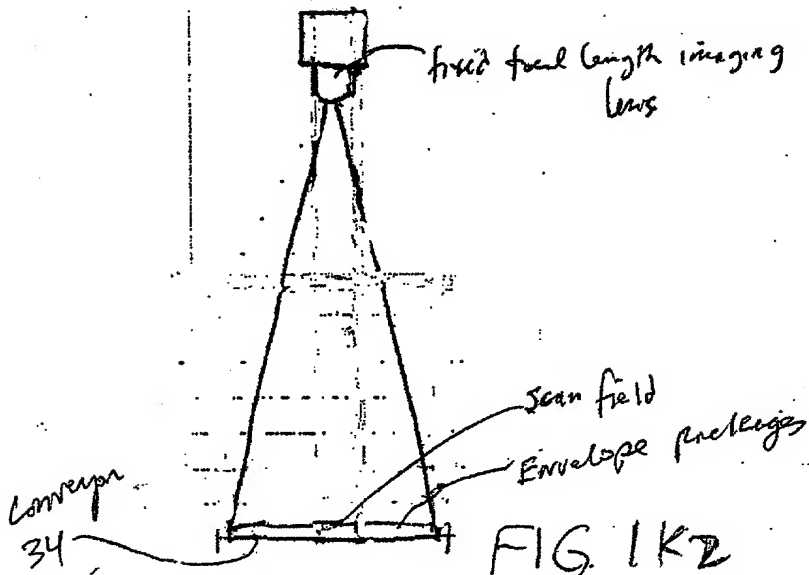
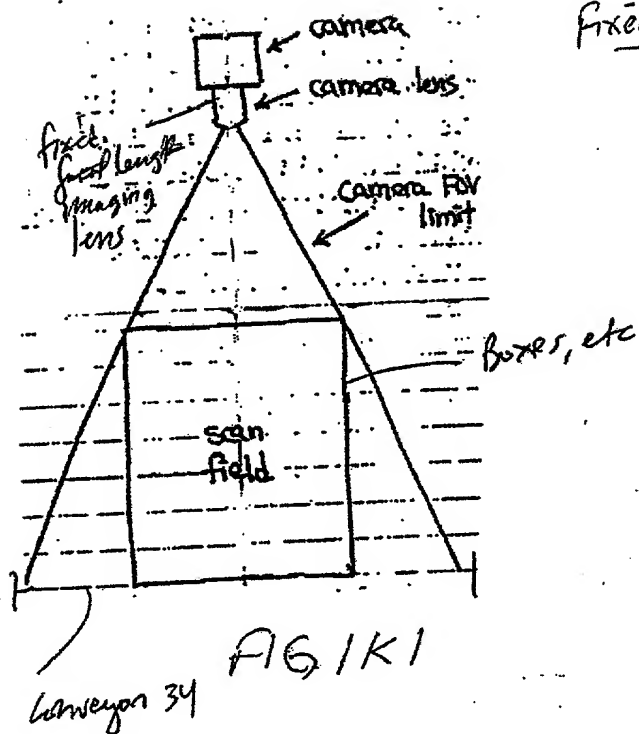
FIG. 1H5

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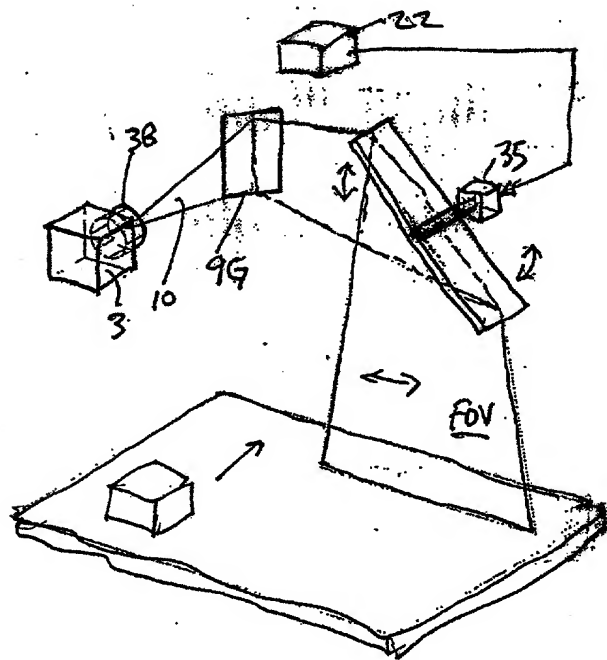
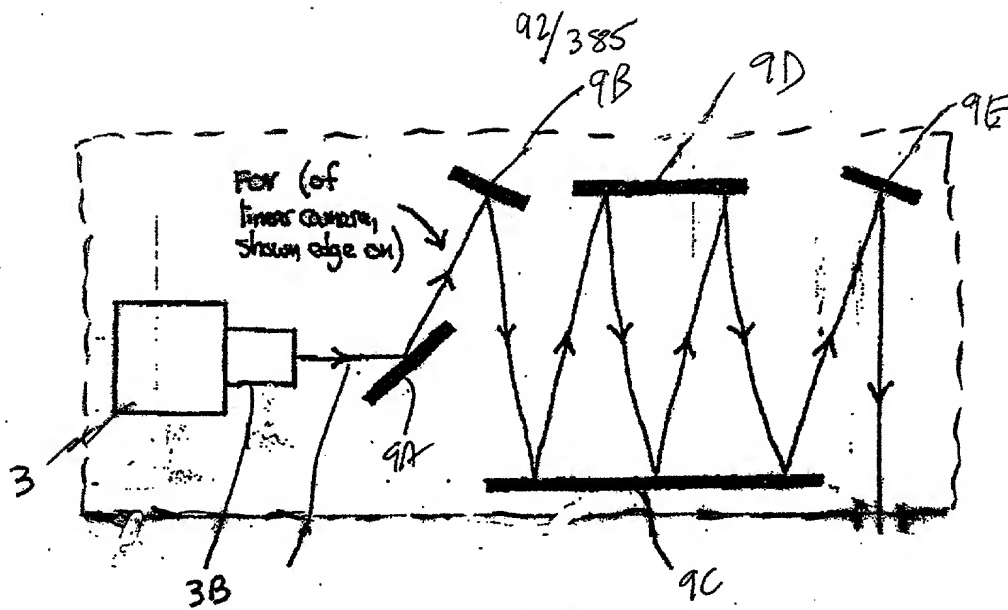


91/385

Fixed focal length lens cases



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93/385

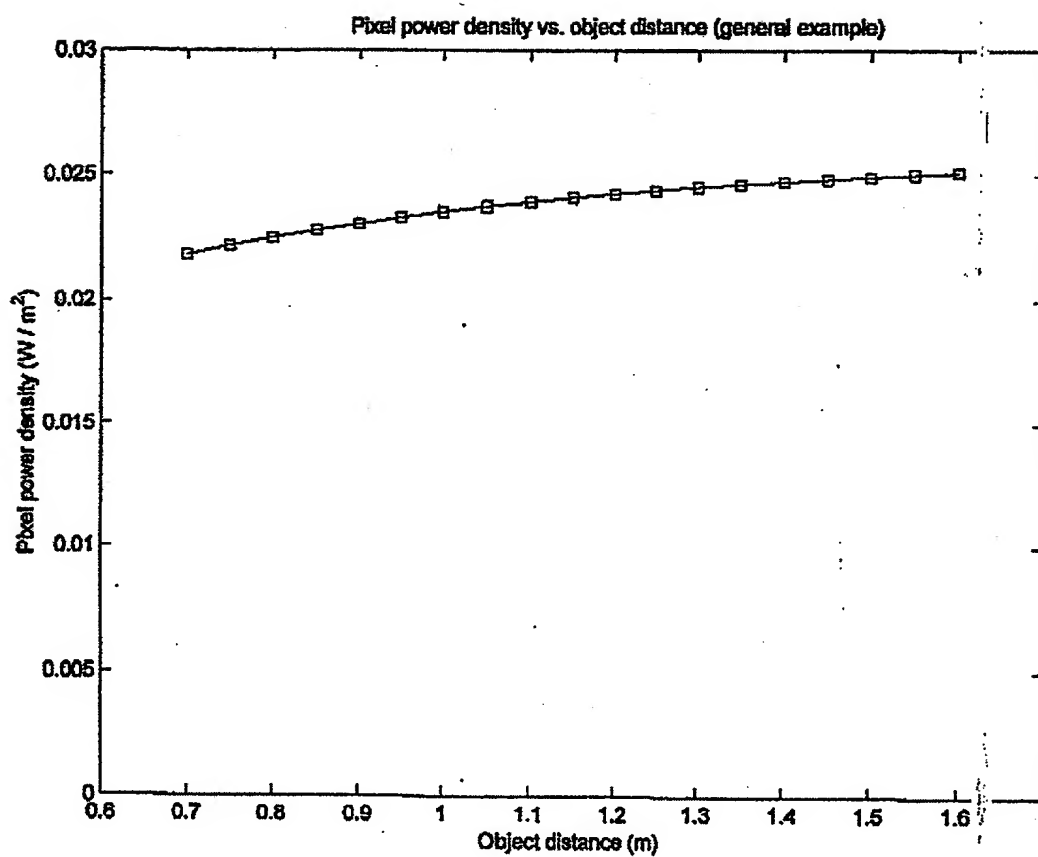


FIG. 1M1

94/385

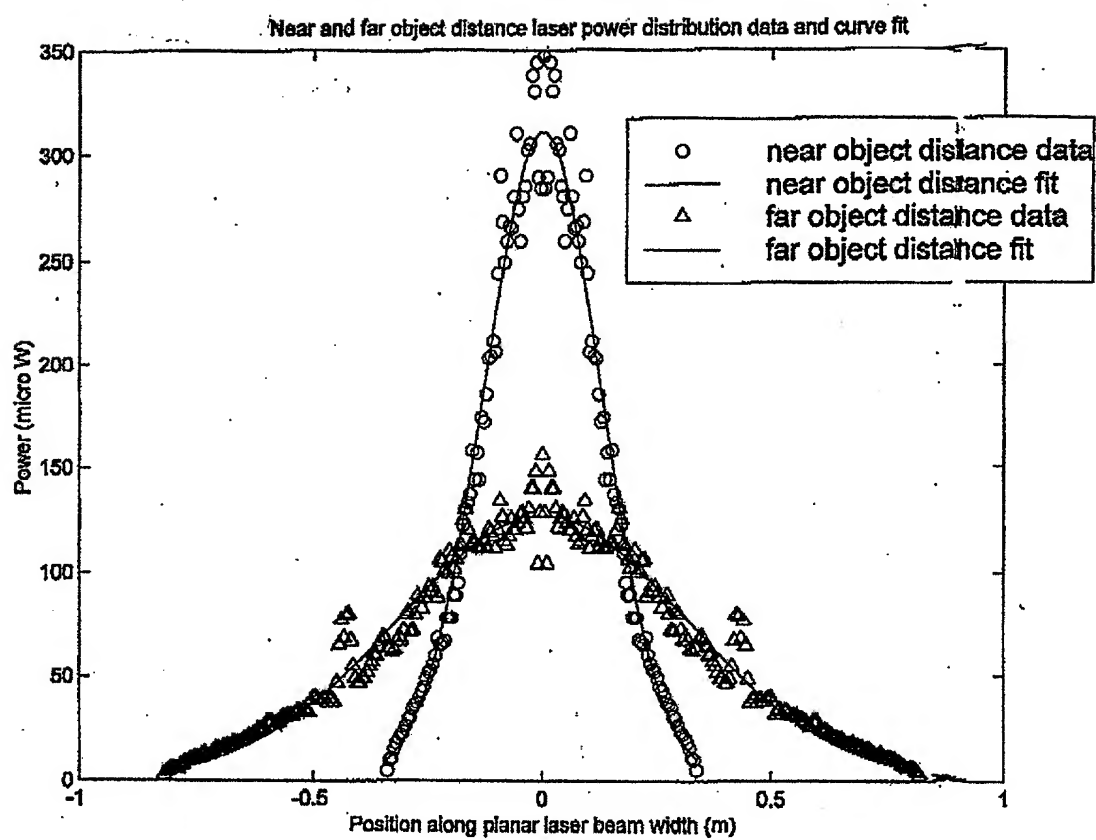


FIG. 1M2

95/385

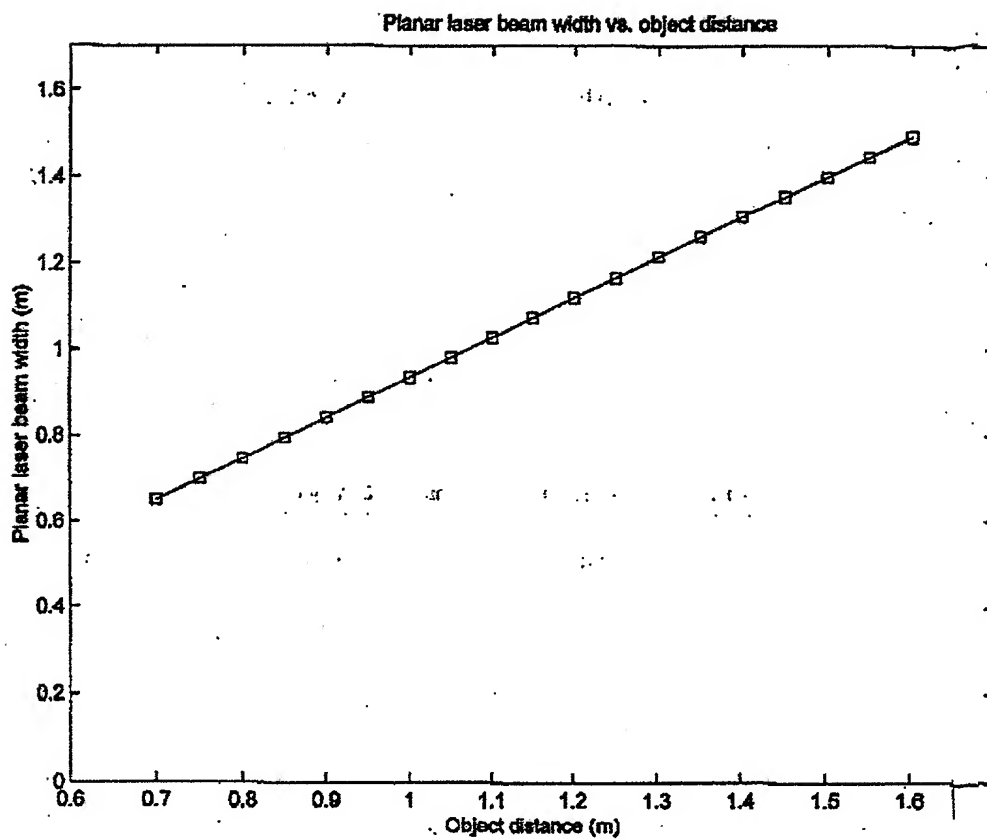
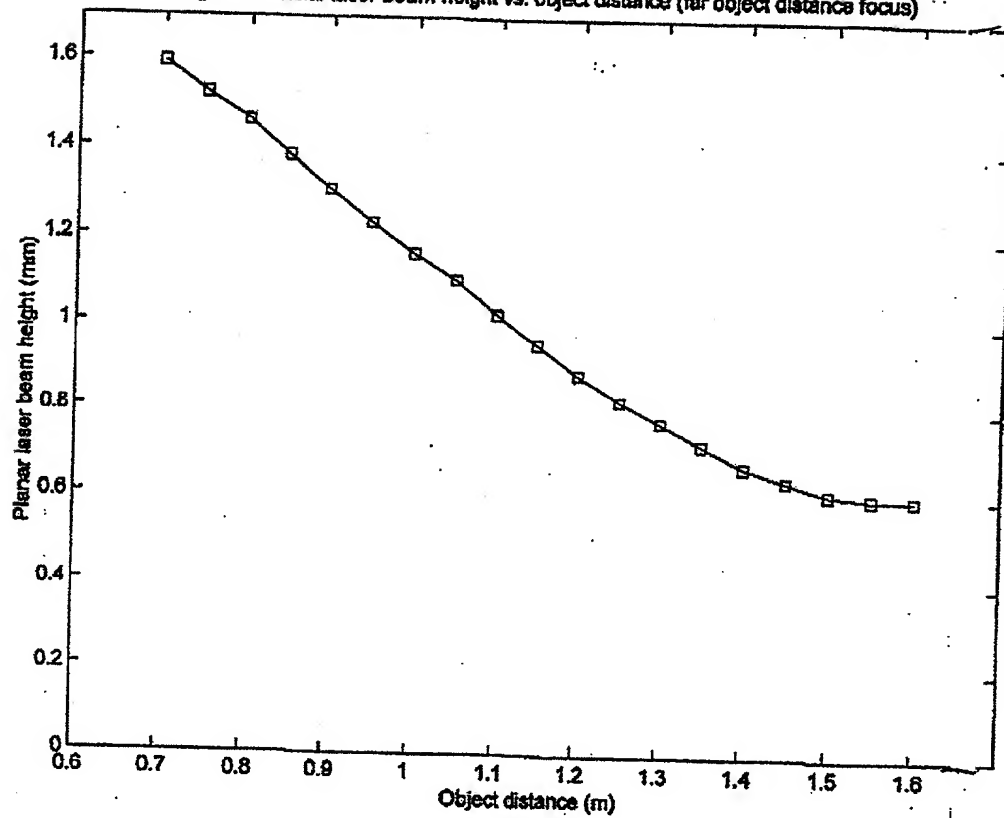


FIG. 1M3

96/385

Figure 4: Planar laser beam height vs. object distance (far object distance focus)



FIG/M4

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97/385

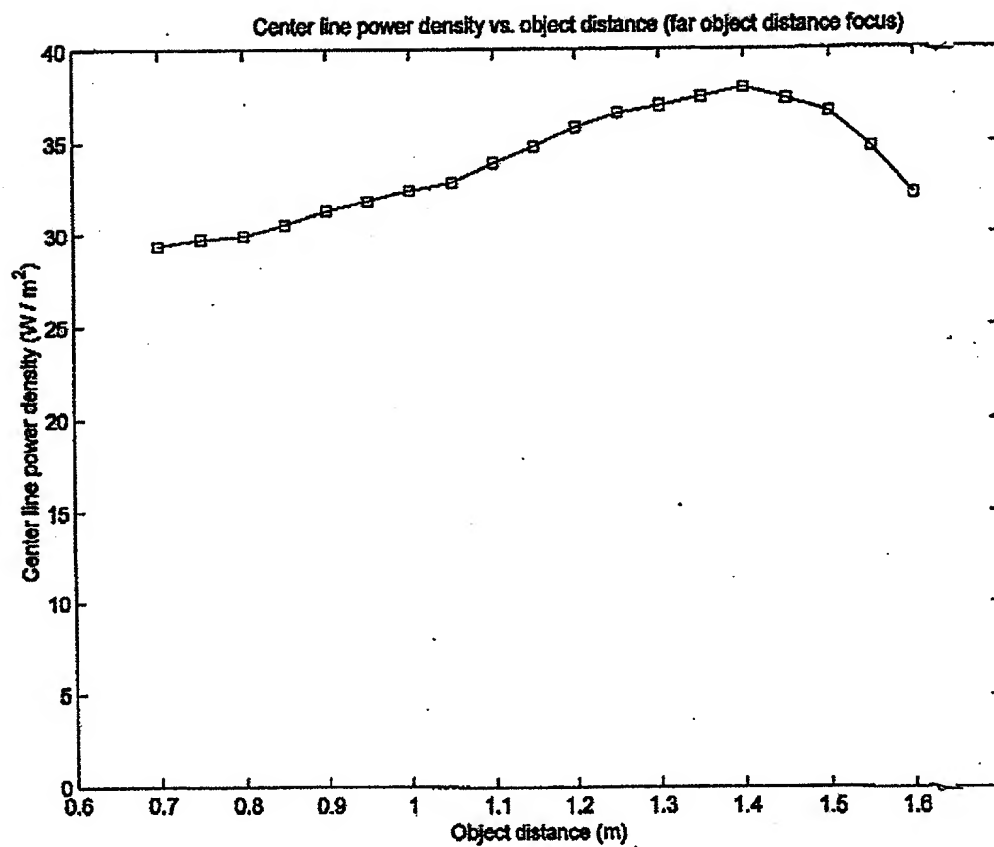


FIG. 1N

98/385

Figure 6: Pixel power densities vs. object distance

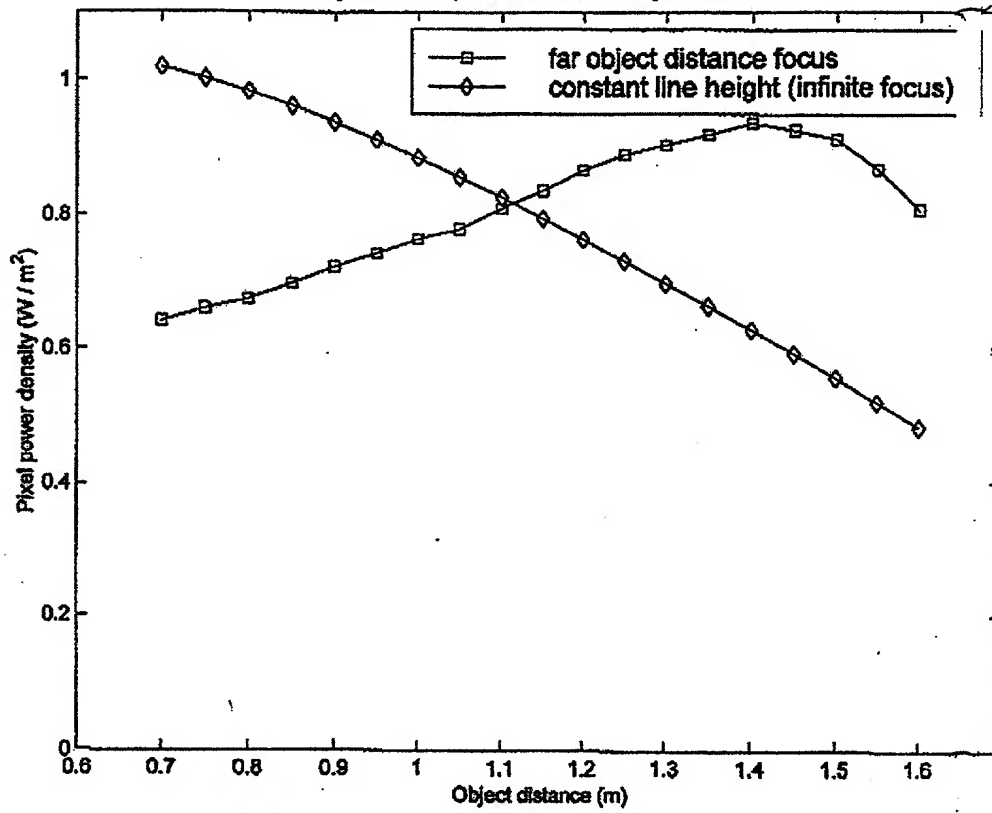


FIG. 10

1006462-020702



99/385

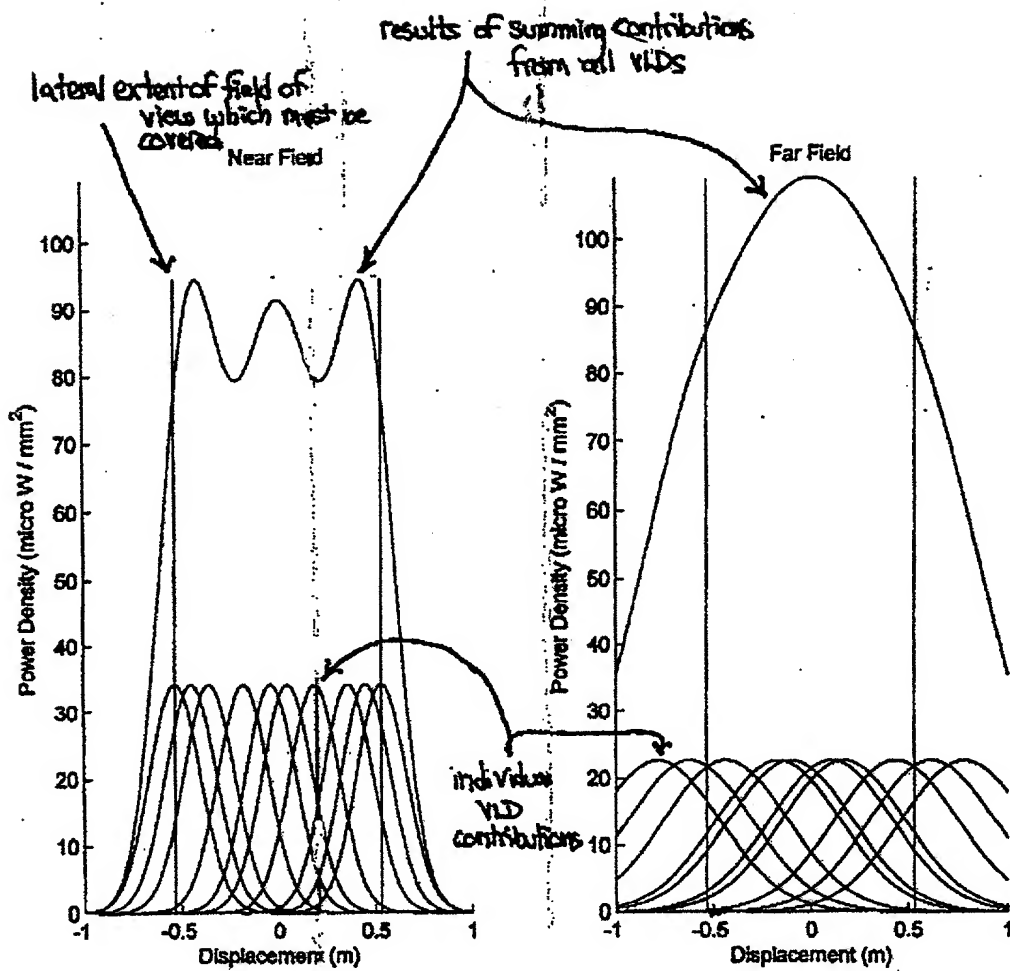


FIG 1P1

FIG 1P2

10063463, 020702

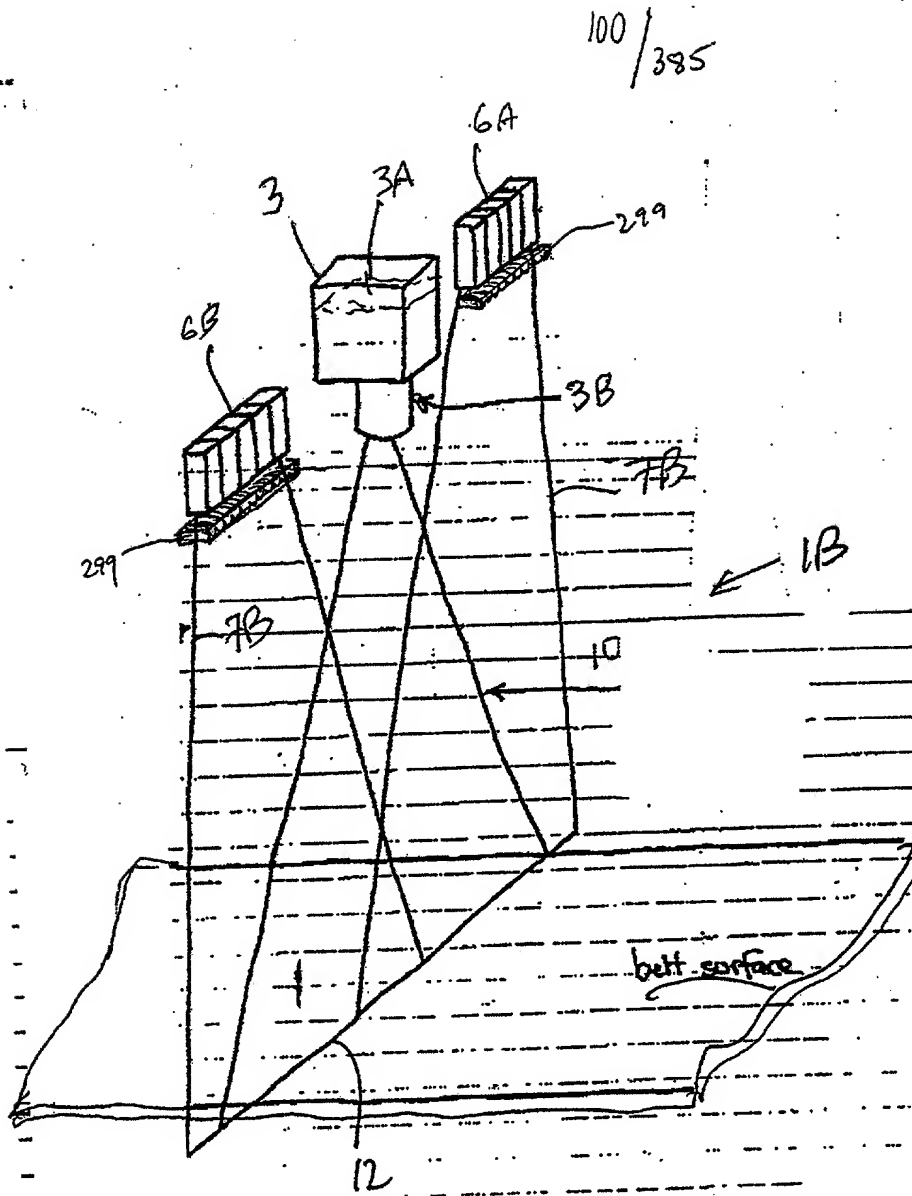


FIG. 1Q1

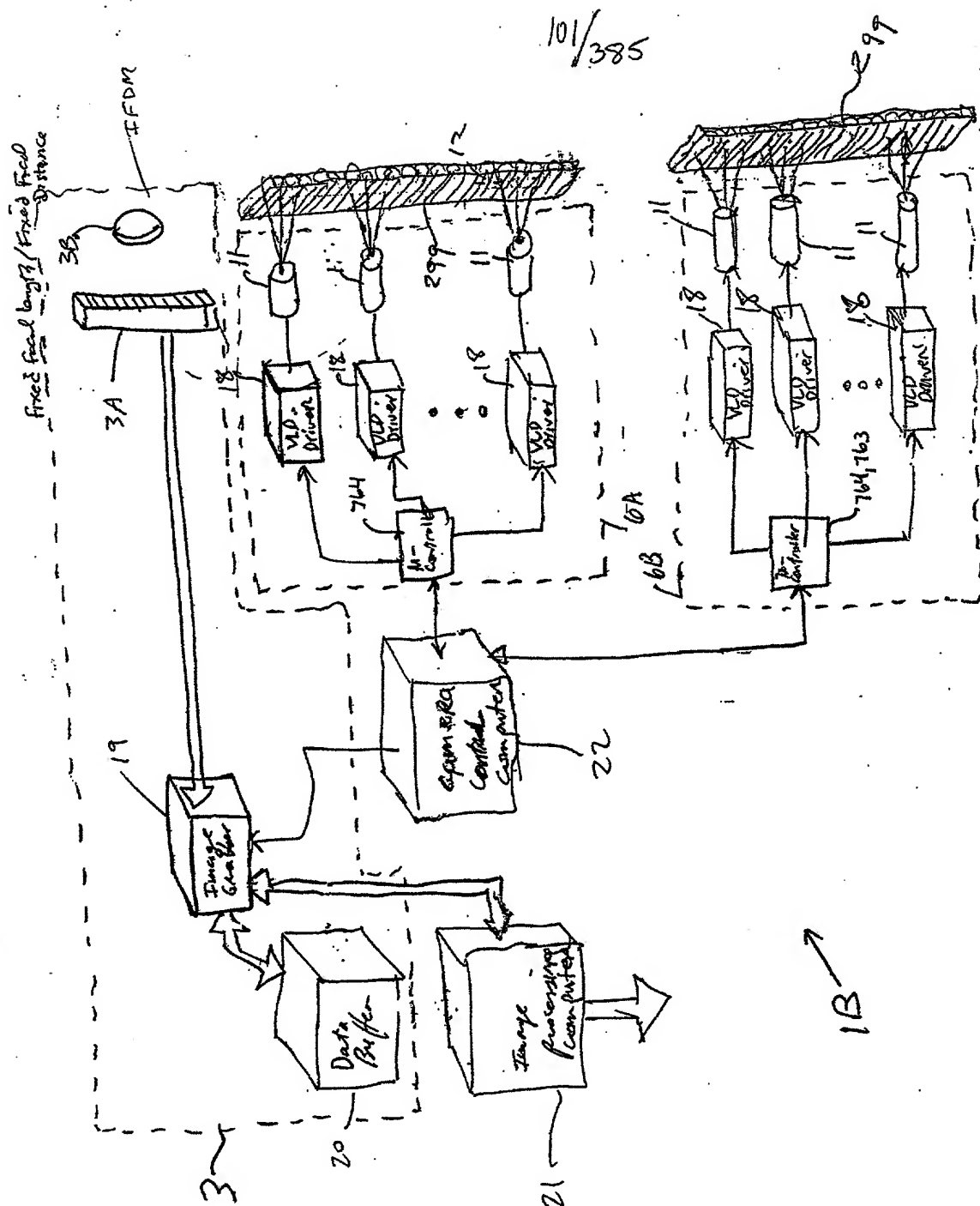


FIG. 102

10063462.020702

102/385

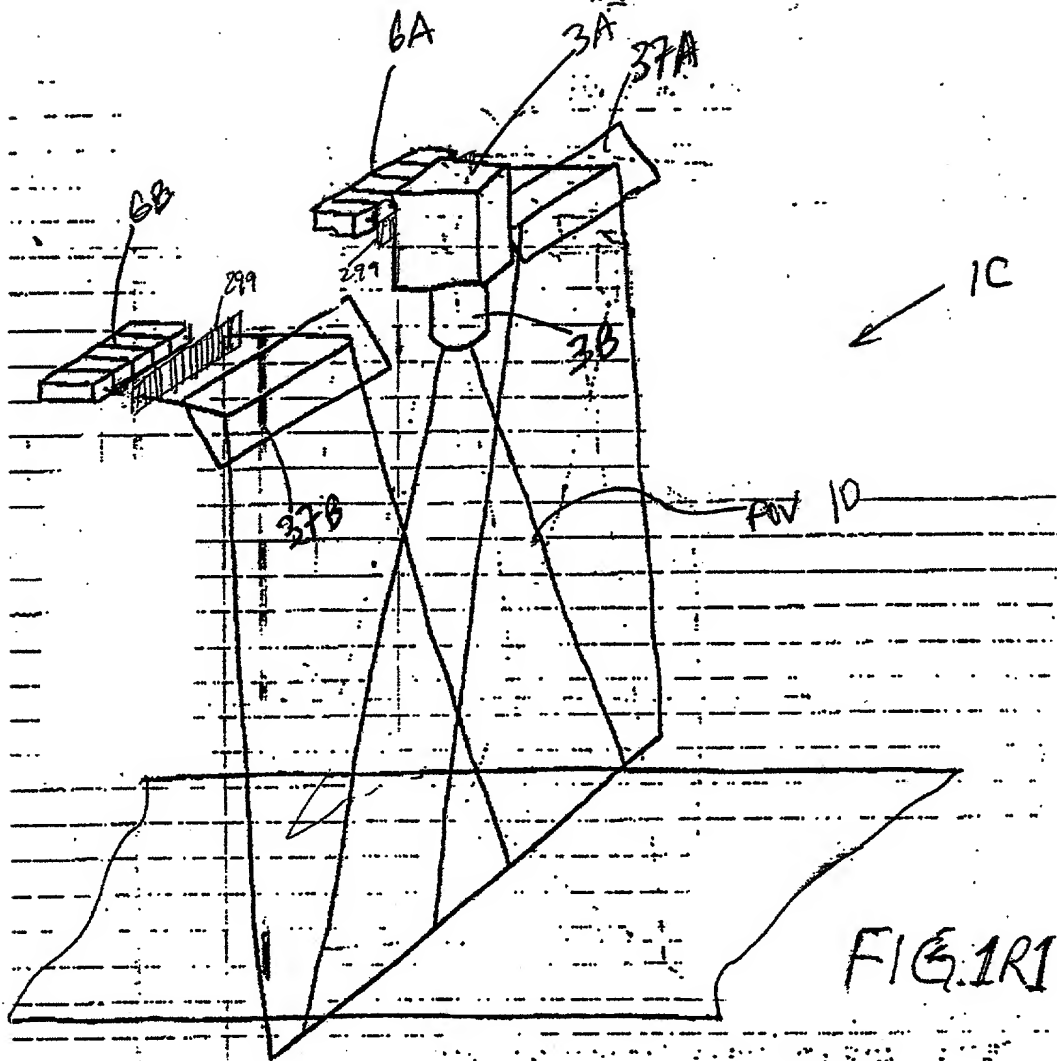


FIG. 1R1

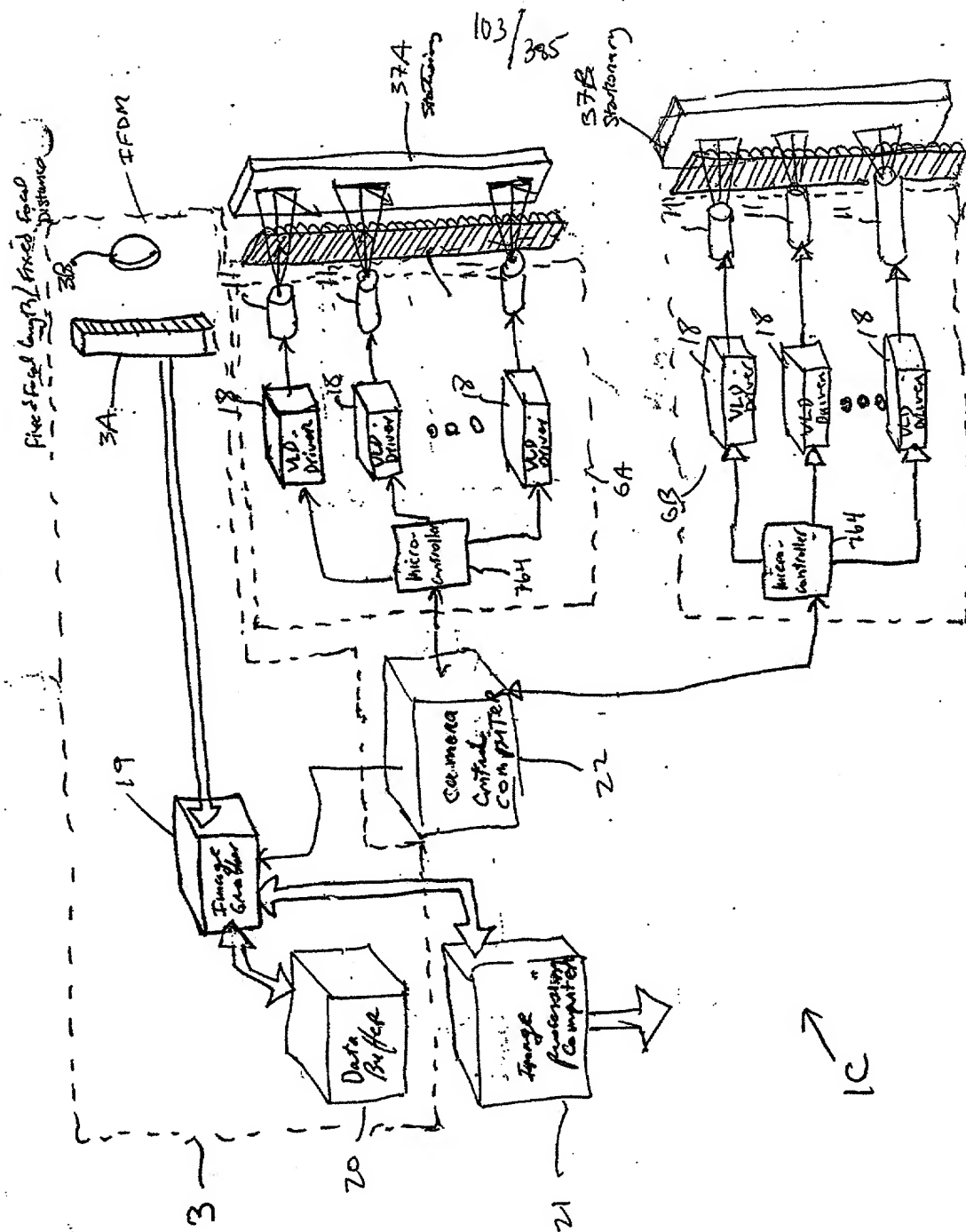


FIG. 1R2

104/385

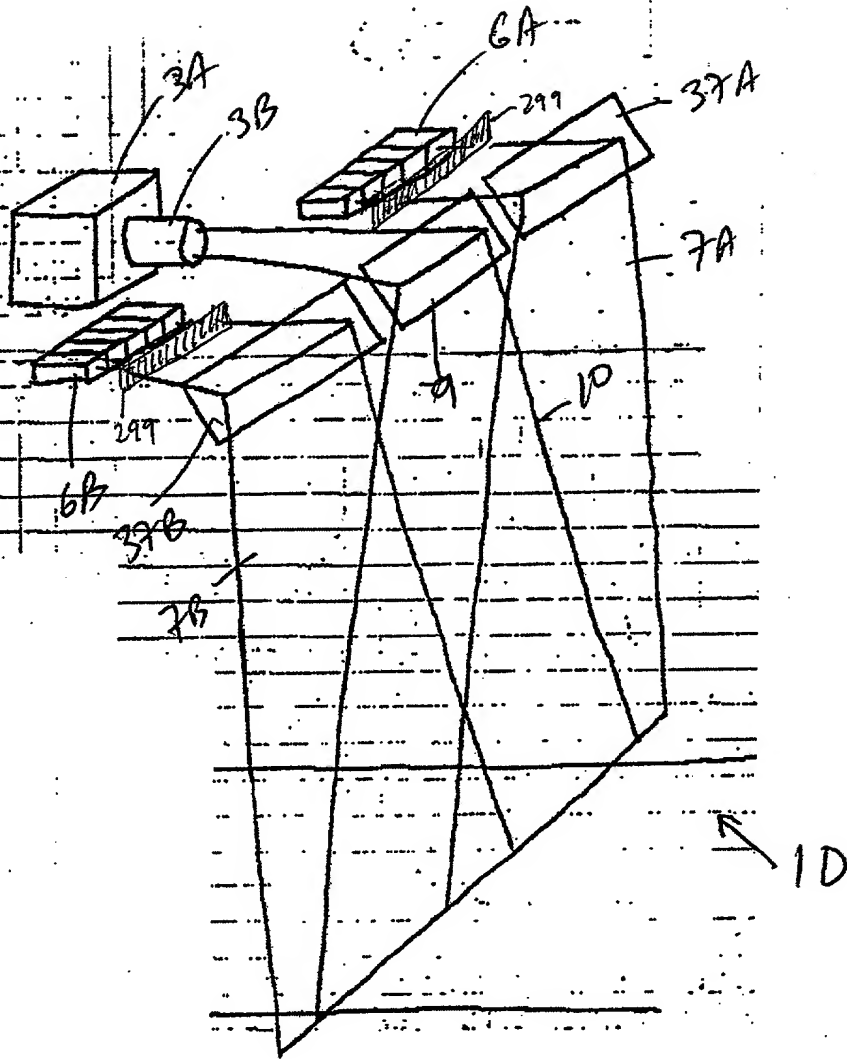


FIG. 1S1

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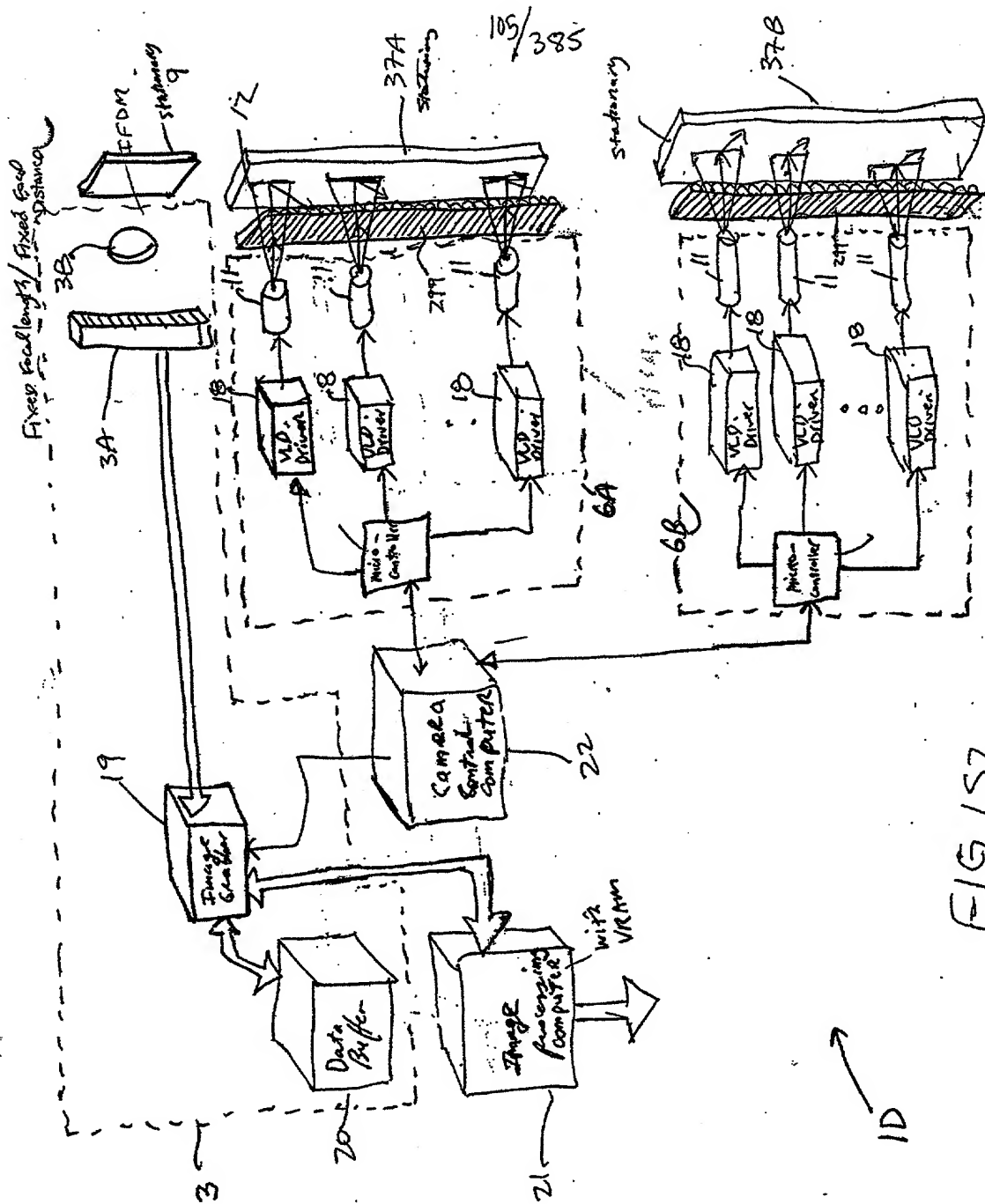


FIG. 152

1D

106/385

1068463.020702

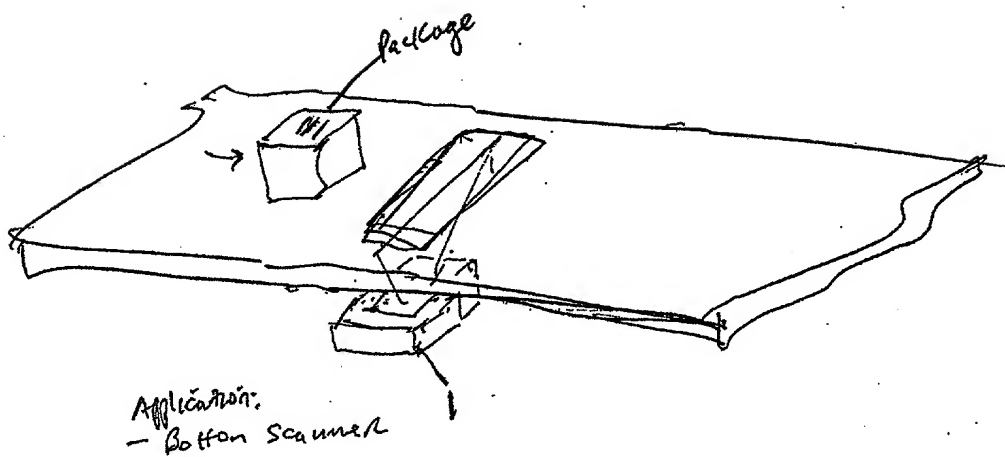


FIG 1T



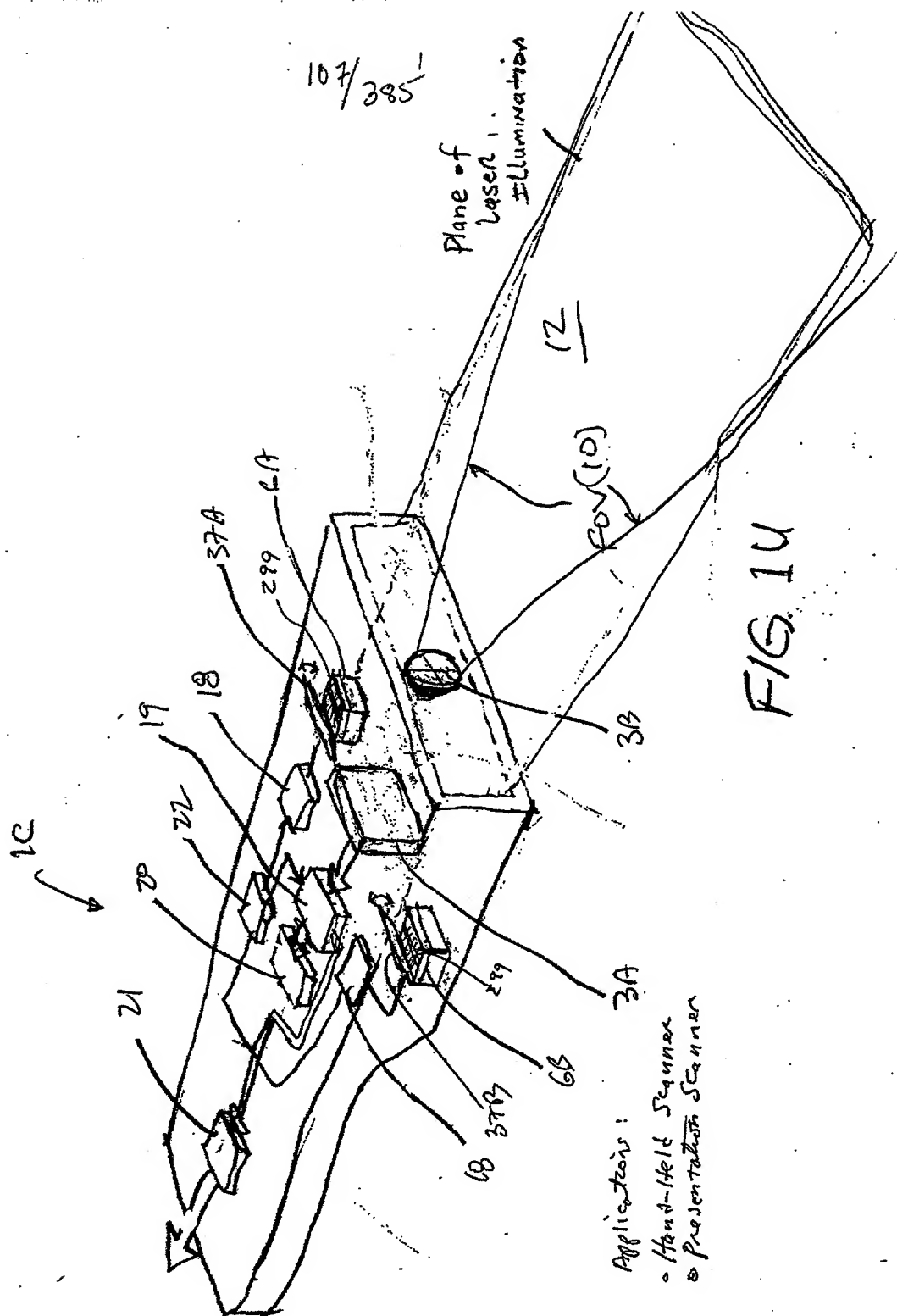


FIG 14

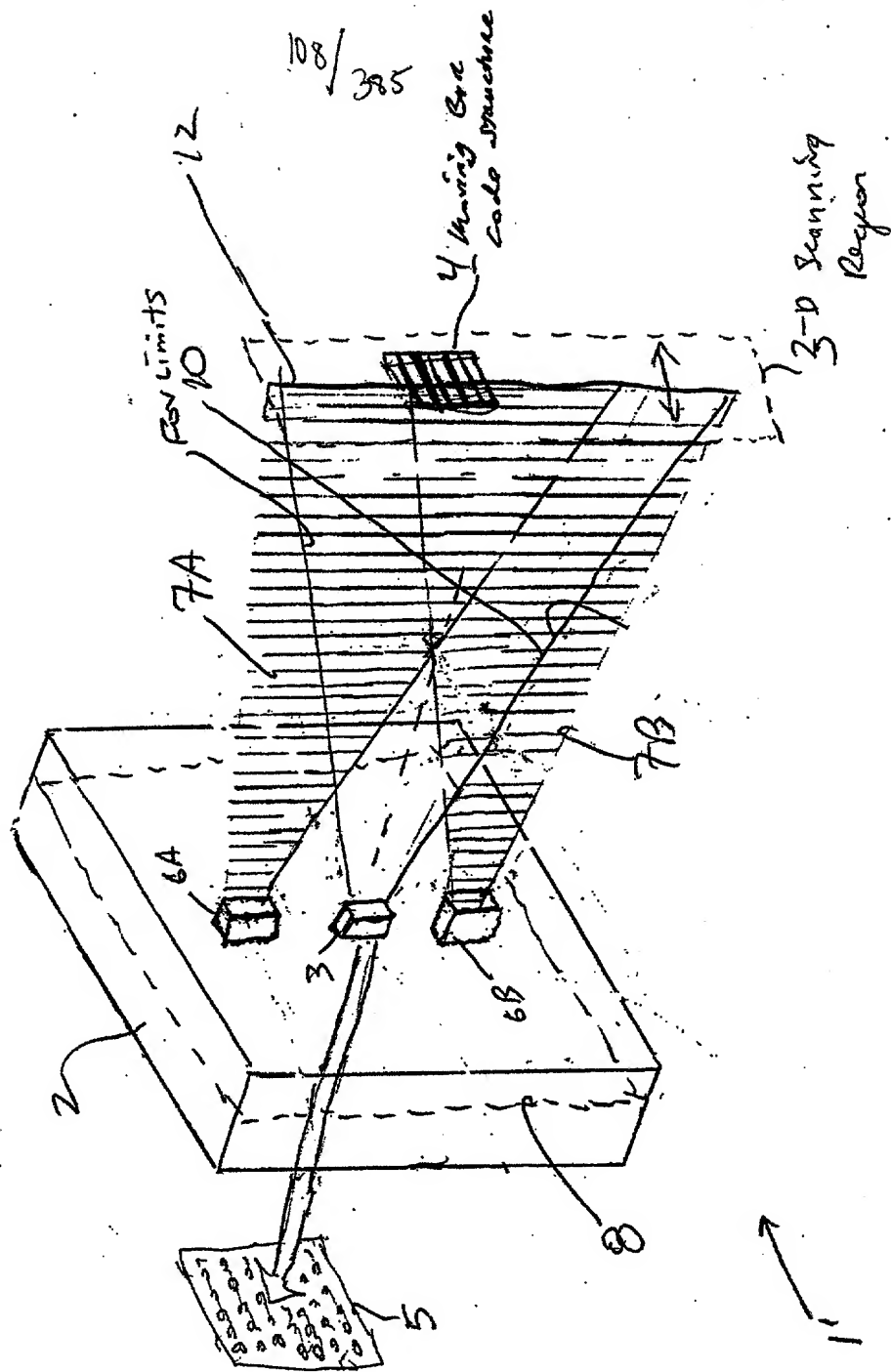


FIG. IVI

109/385

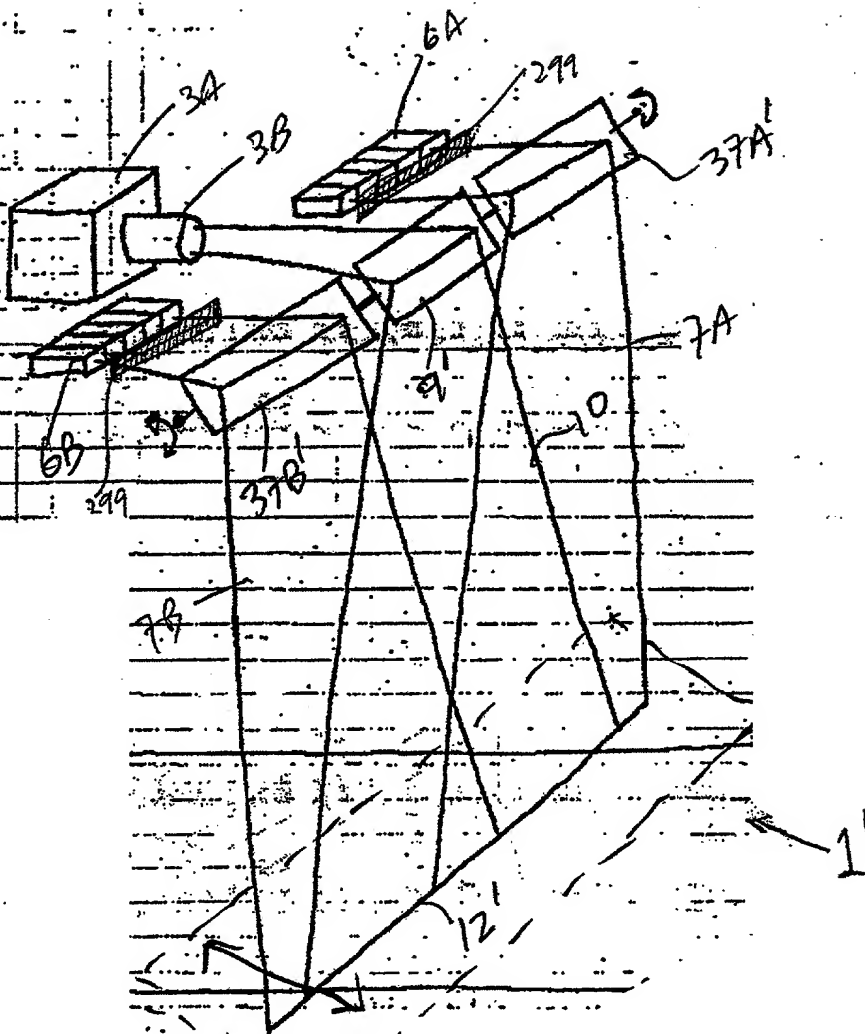


FIG. IV2

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Fig. 1 V3

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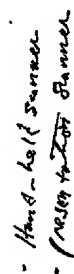


FIG. 1V4



113/385

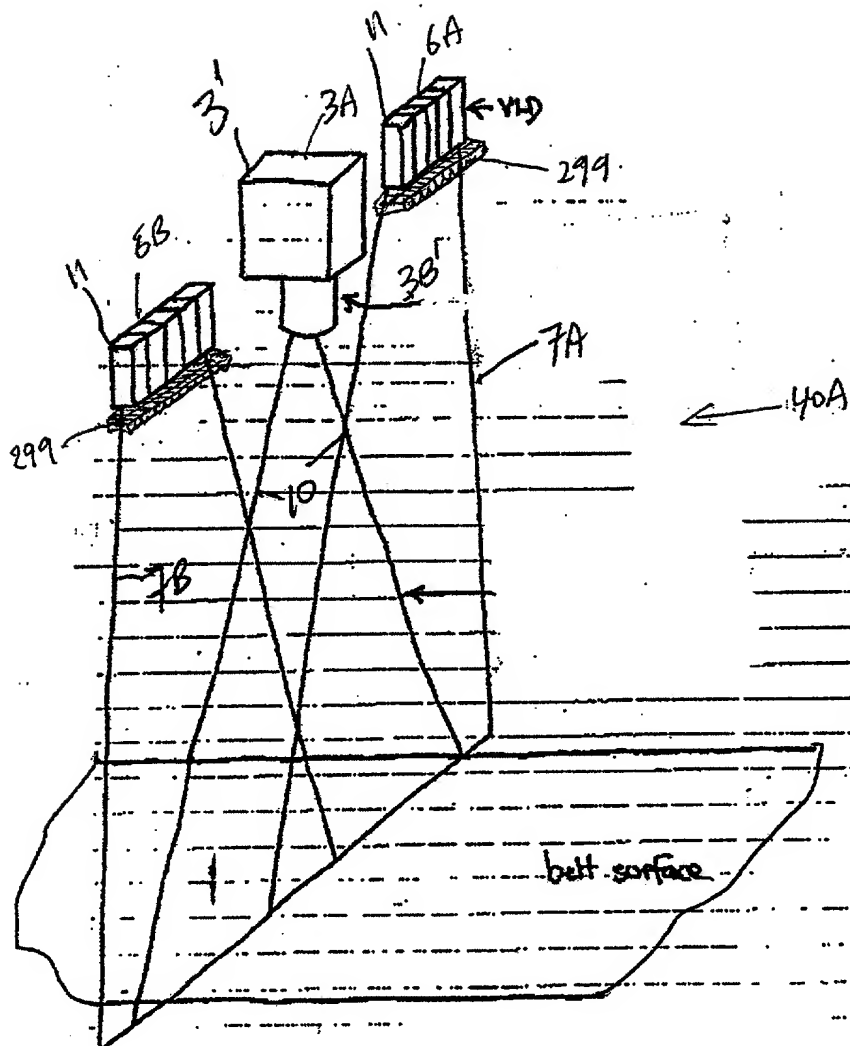


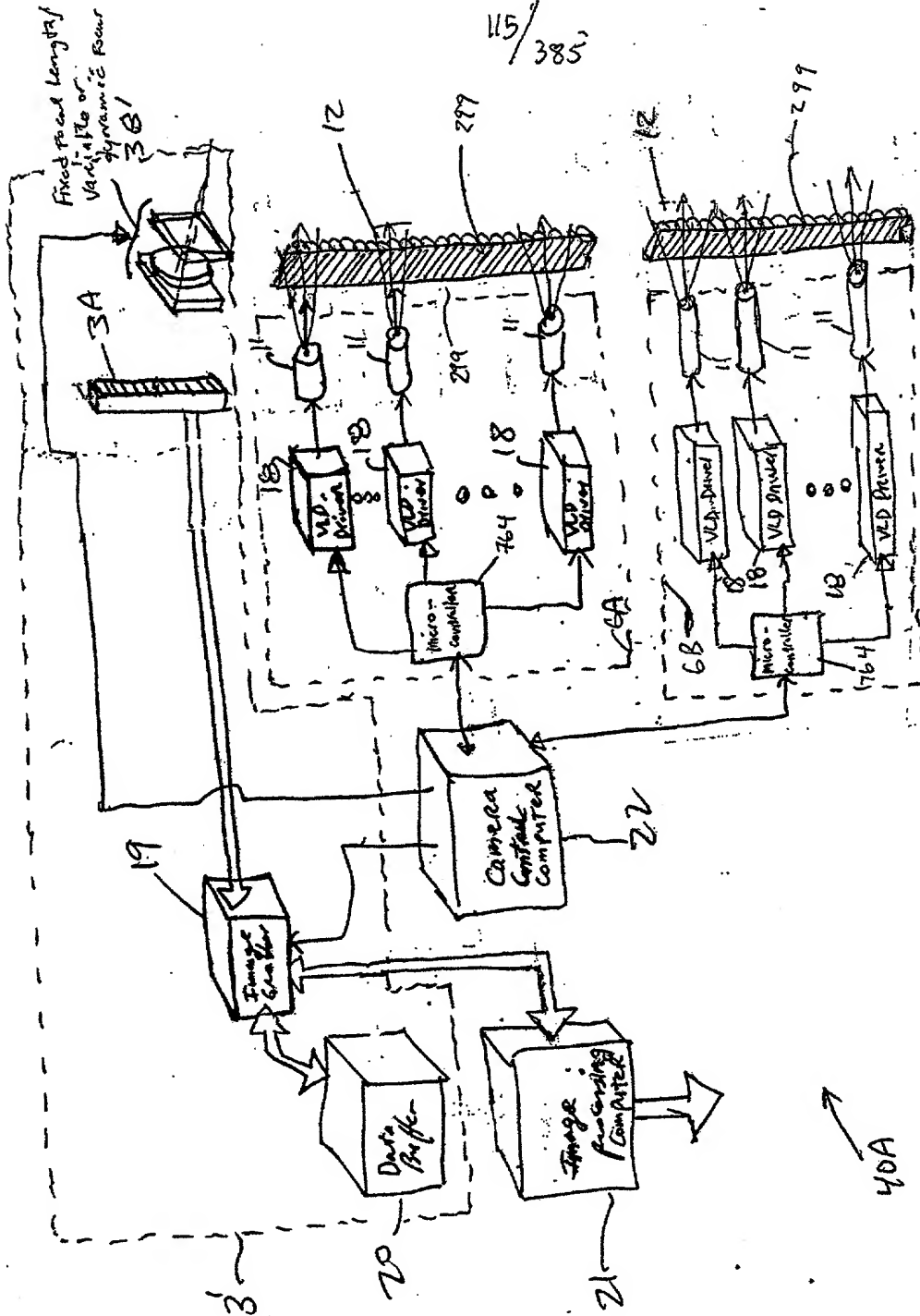
FIG. 2 B1



FIG. 2B2



115 / 385



116/385

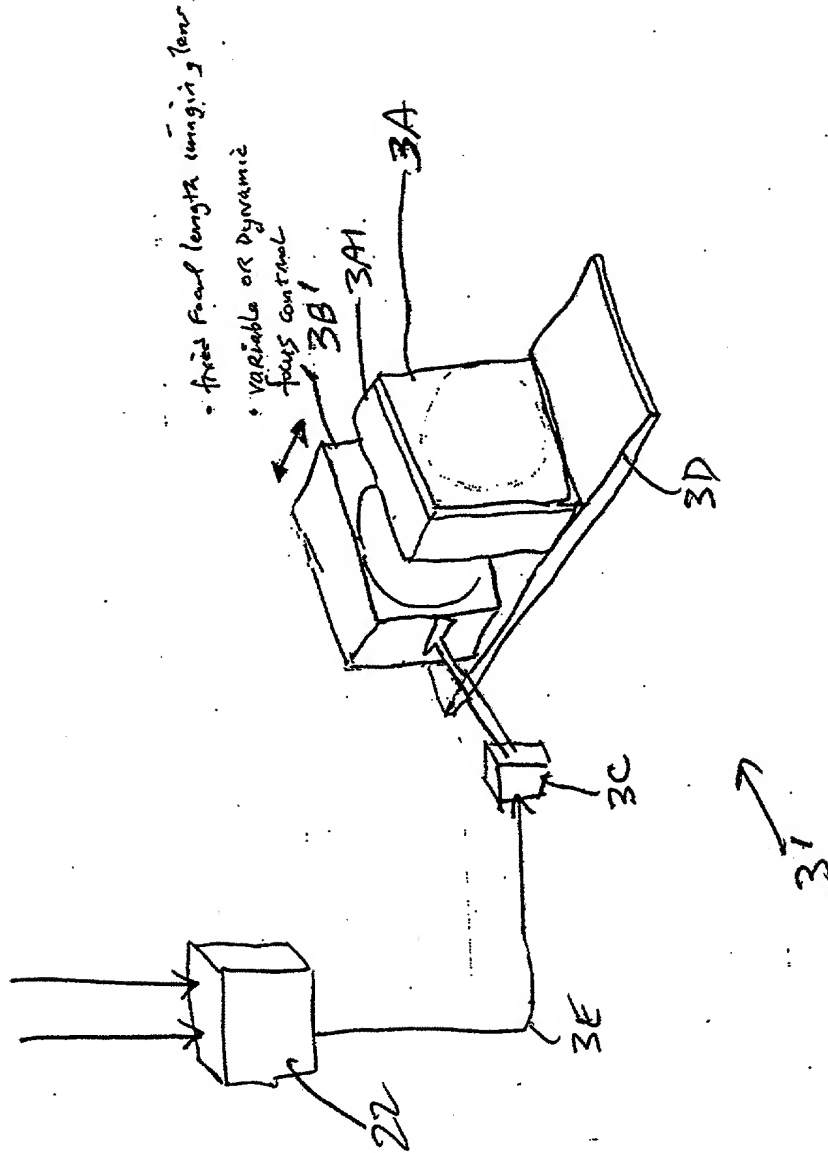


FIG. 2C2

117/385

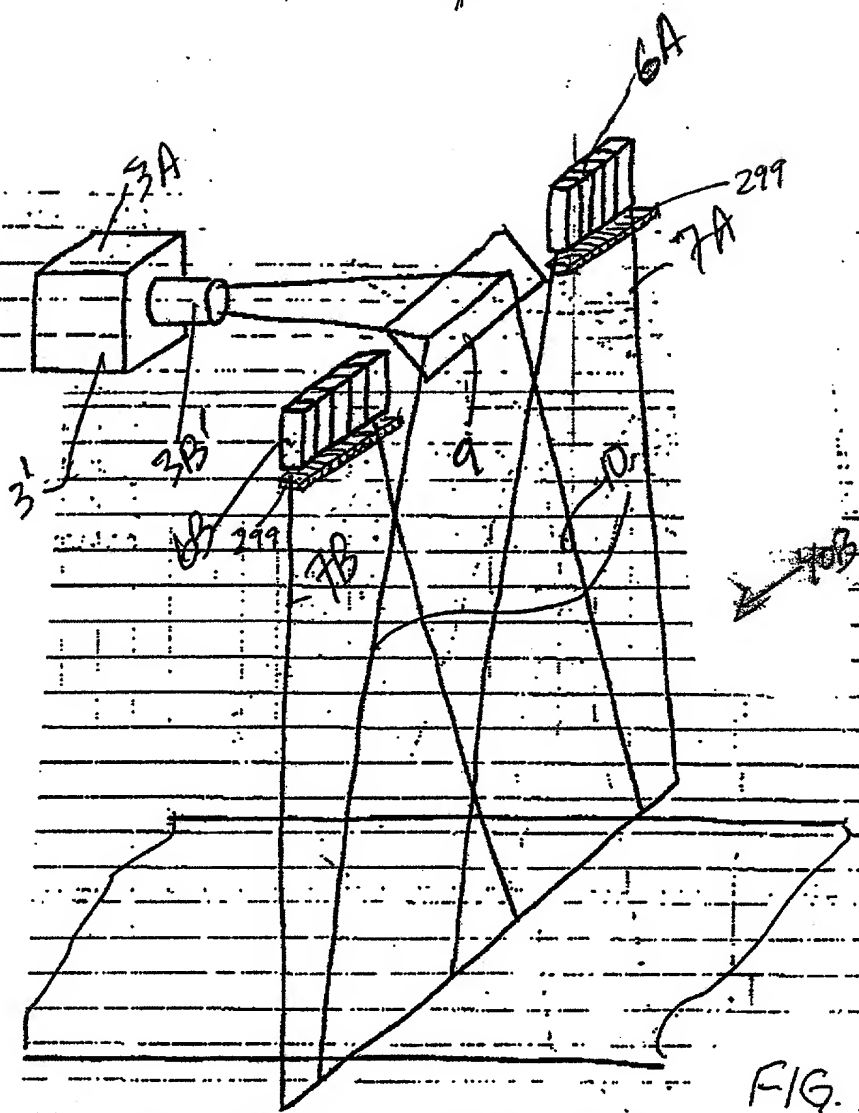


FIG. 2D1

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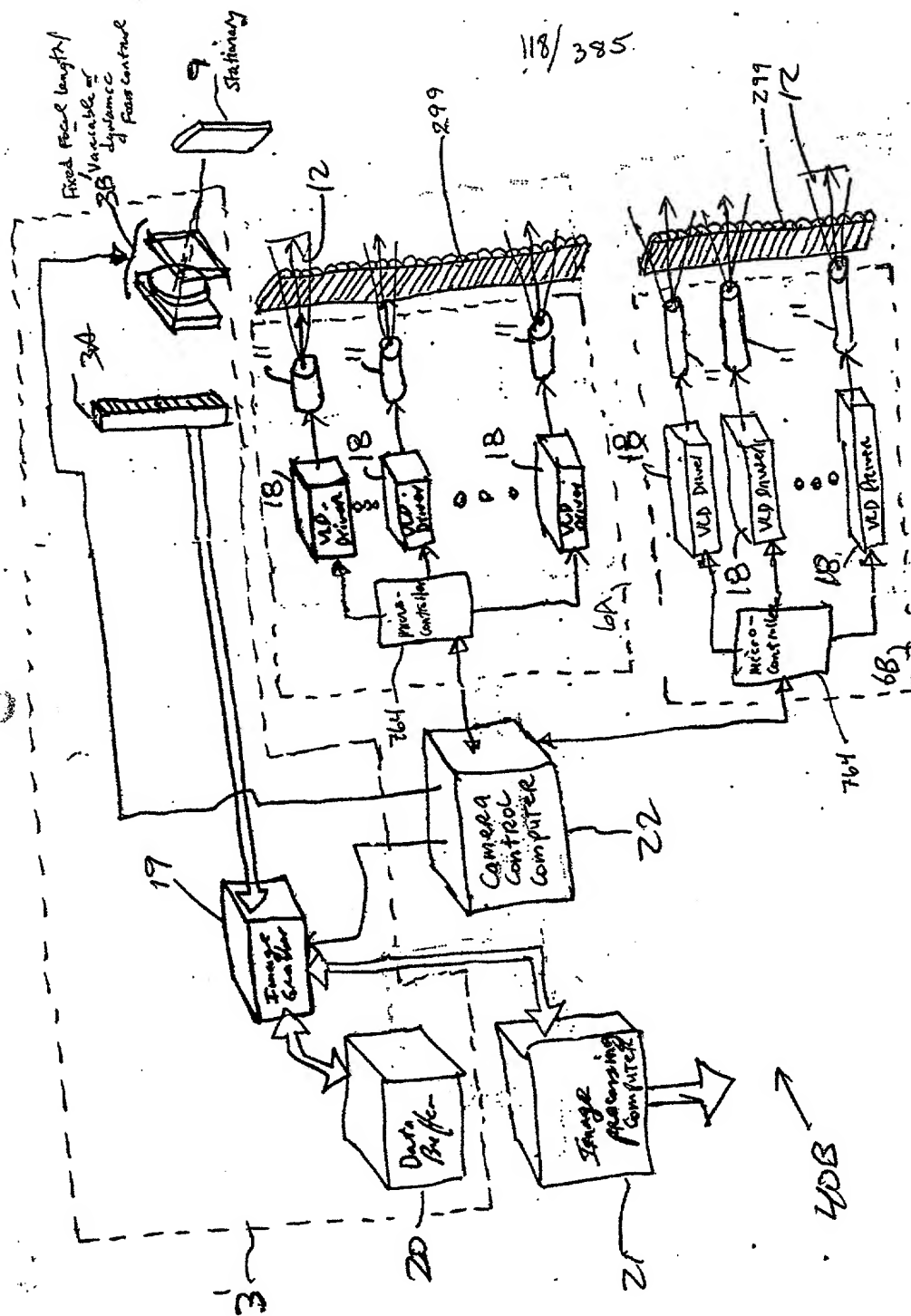


FIG. 2D2

119/385

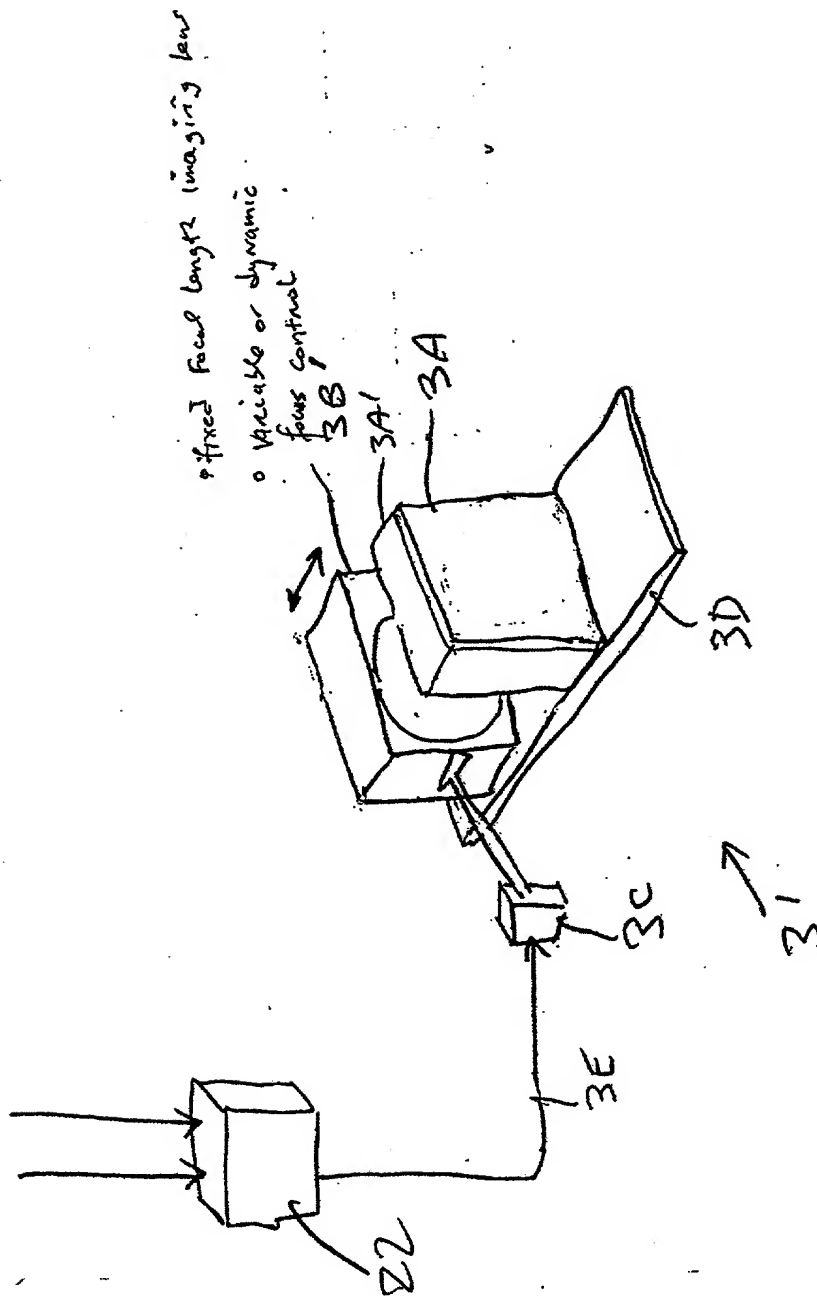


FIG. 2D3

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120/385

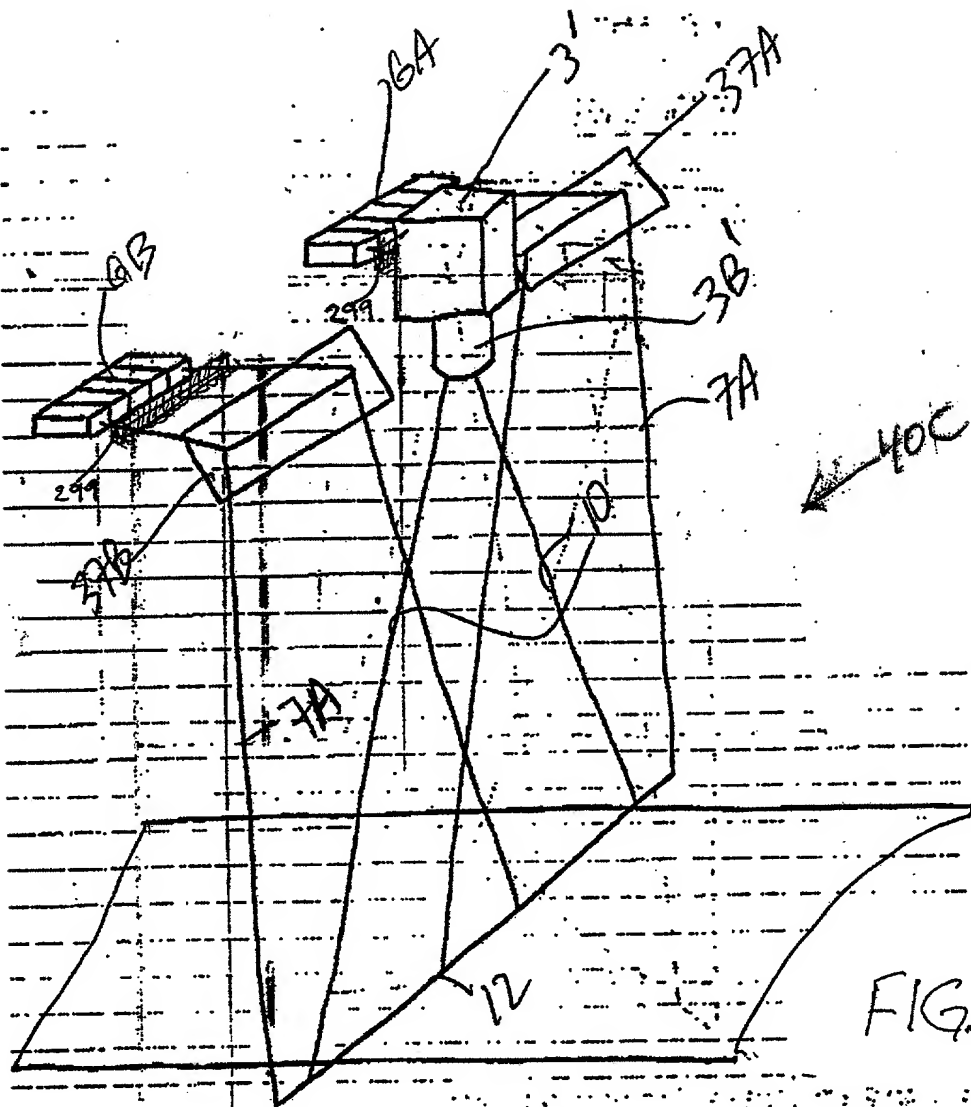
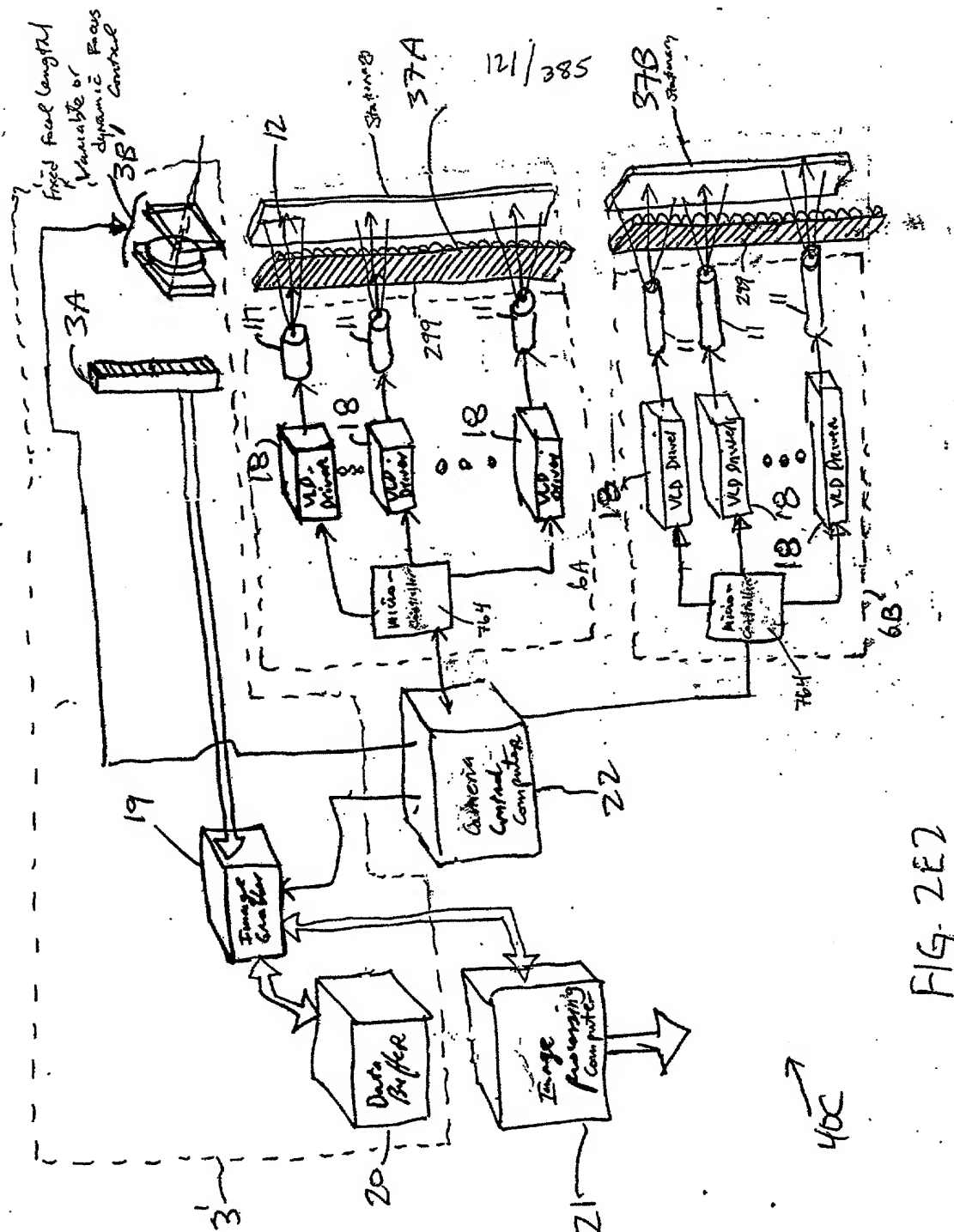


FIG. 2E1



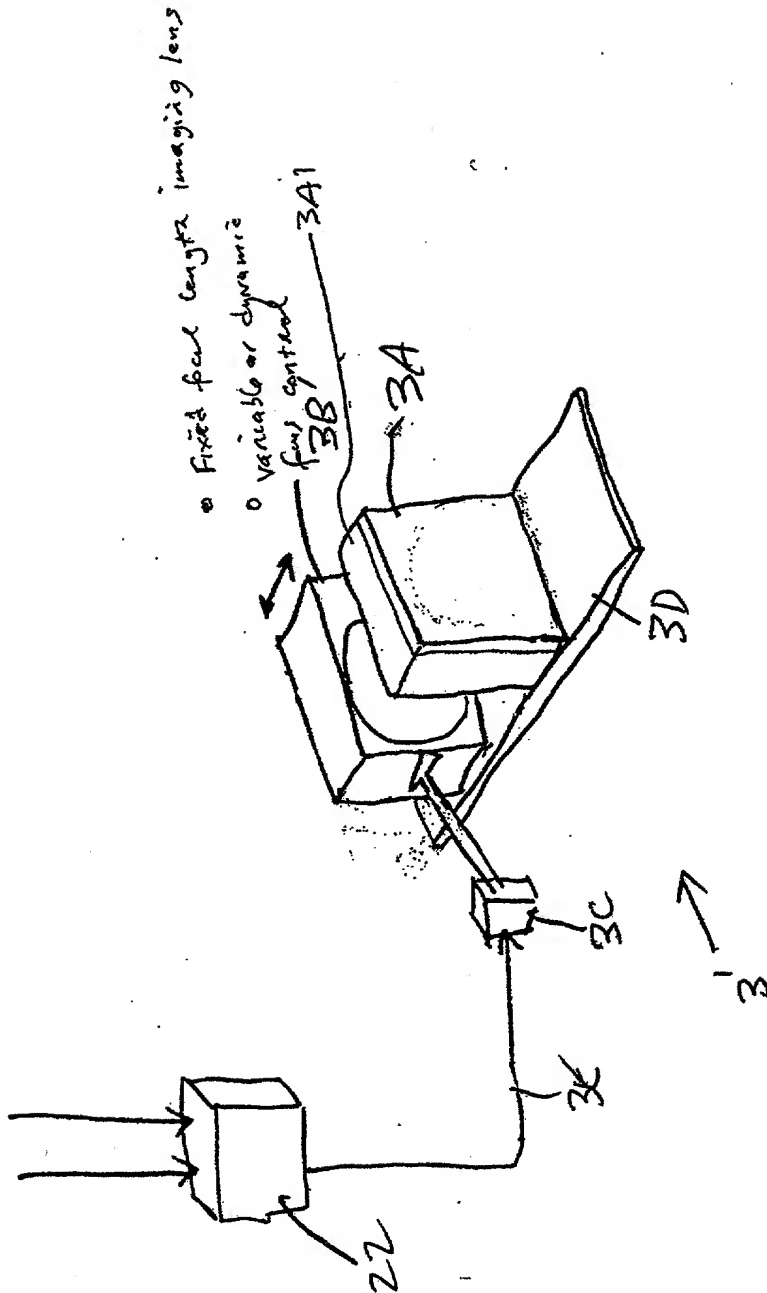


FIG. 2E3



10068452.020702

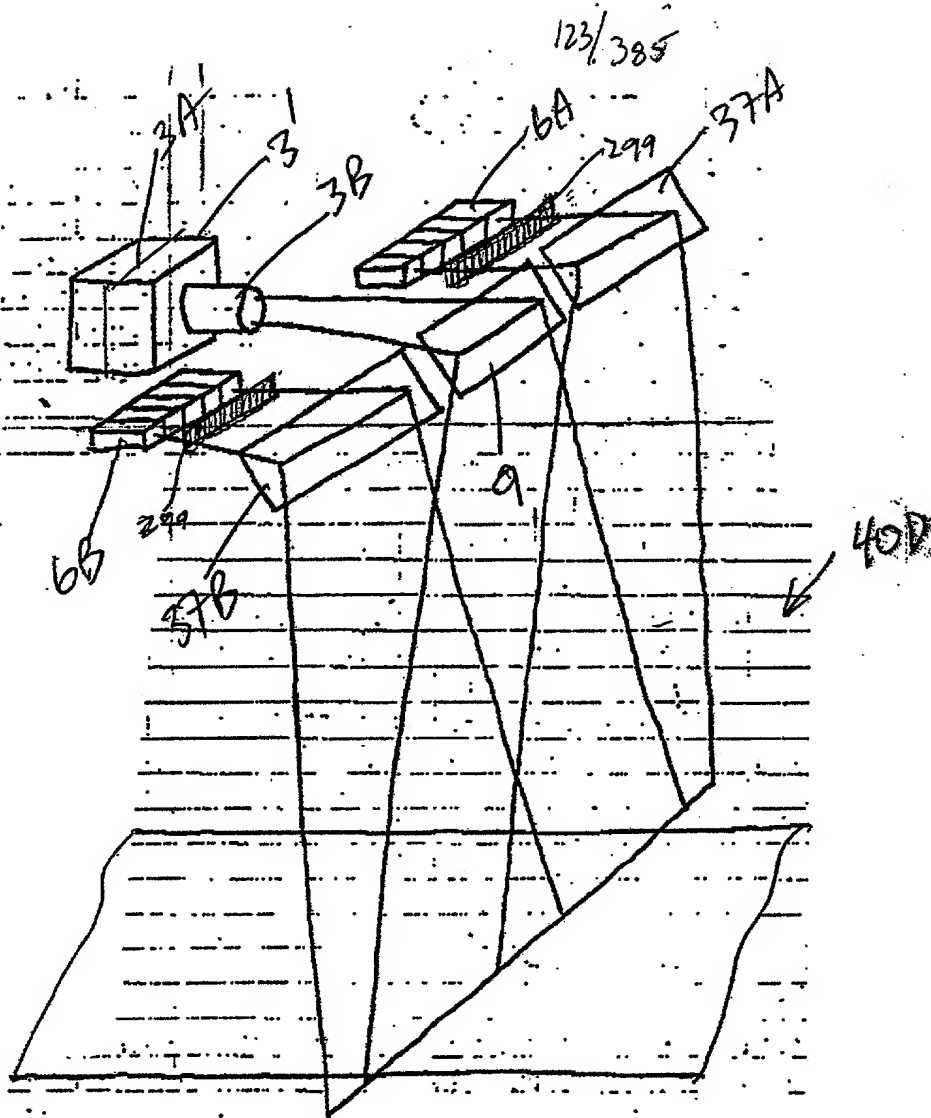


FIG. 2F1

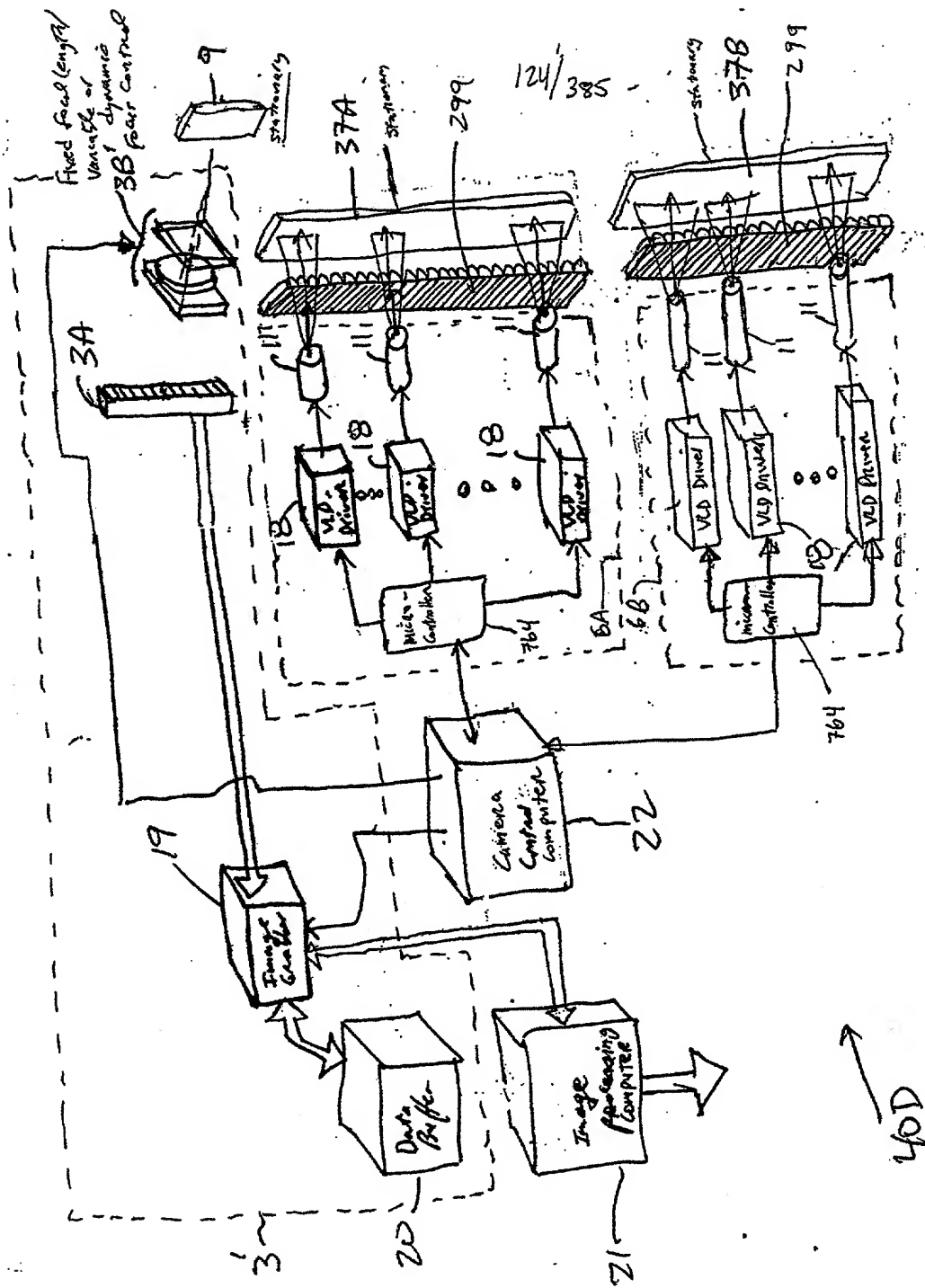


FIG. 2F2

125/385

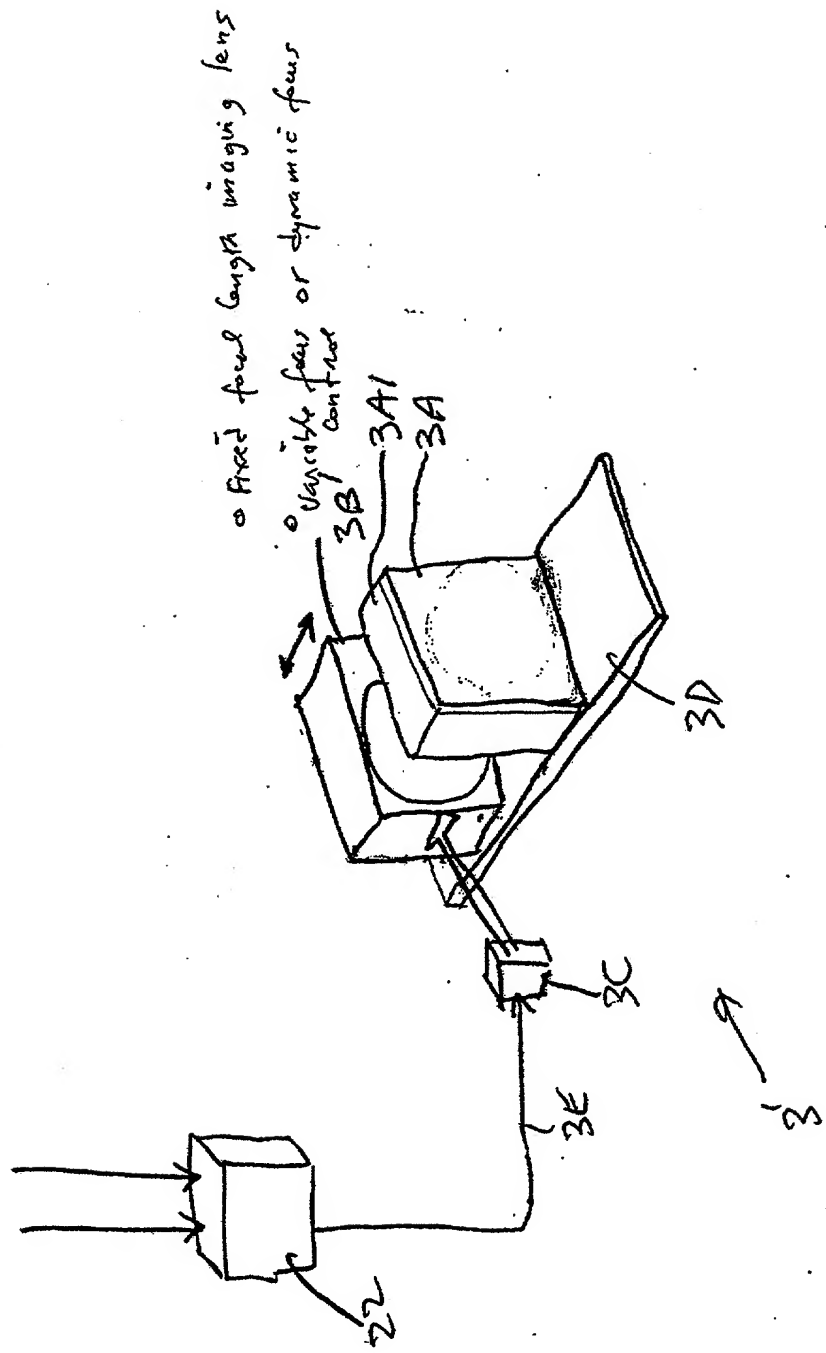


FIG. 2F3

126/385

202020-23489001

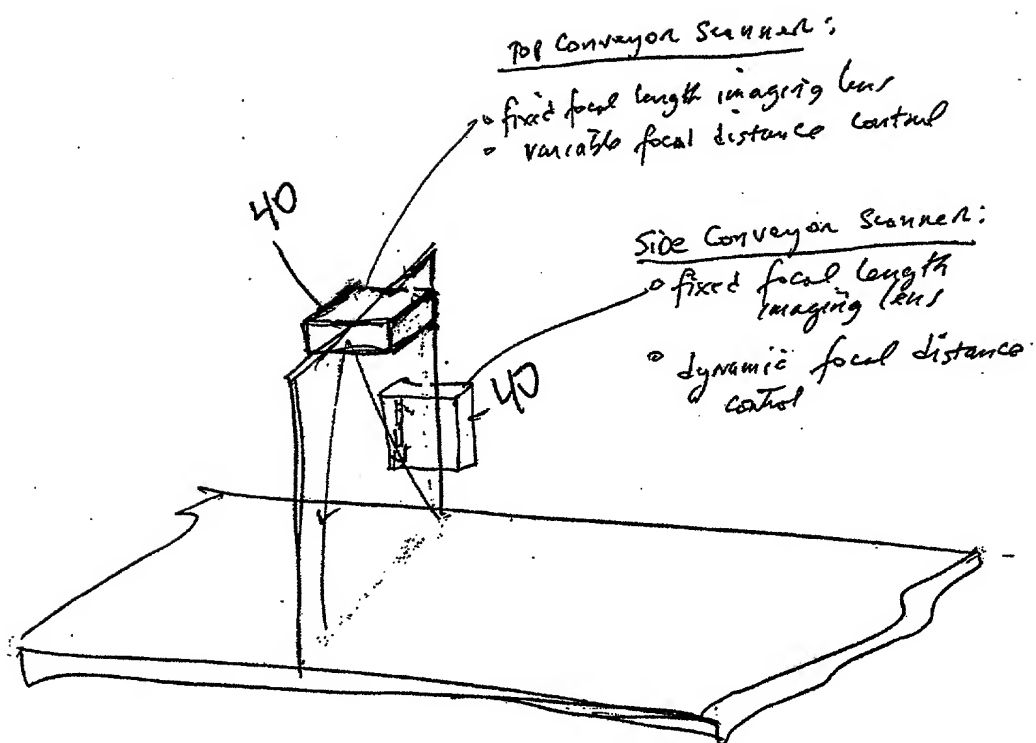
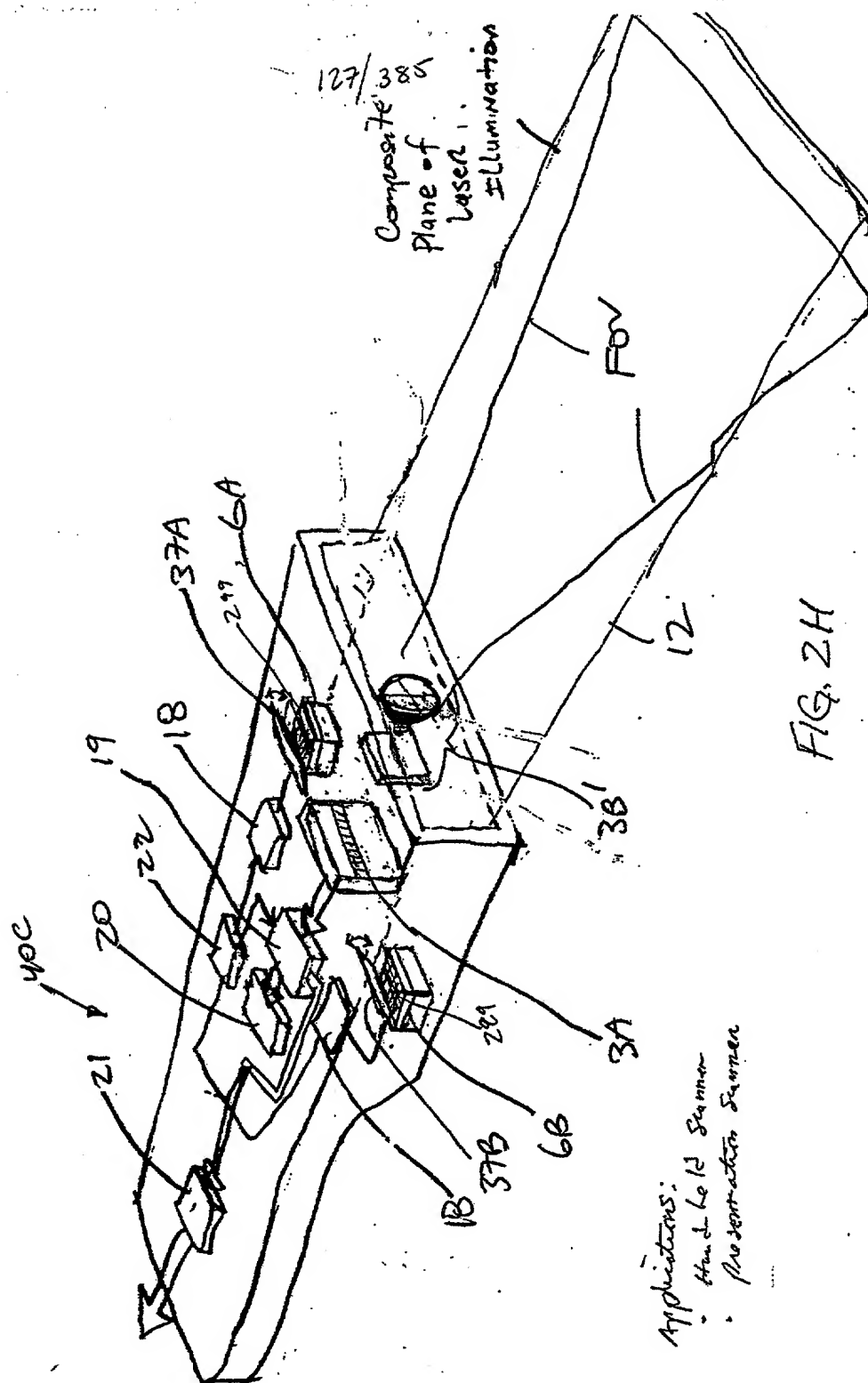
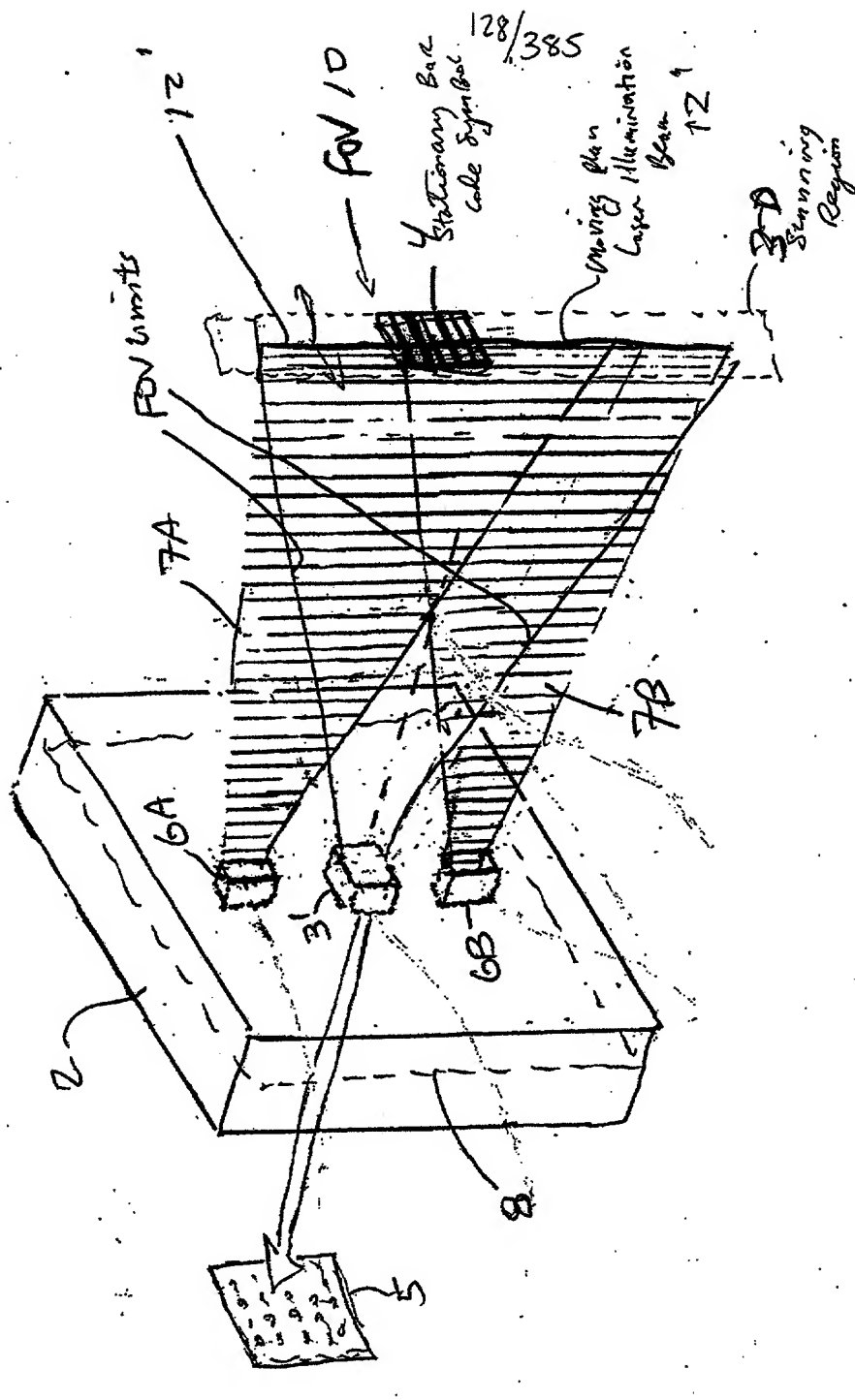
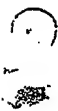


FIG. 2G





10068462.020702

129/385

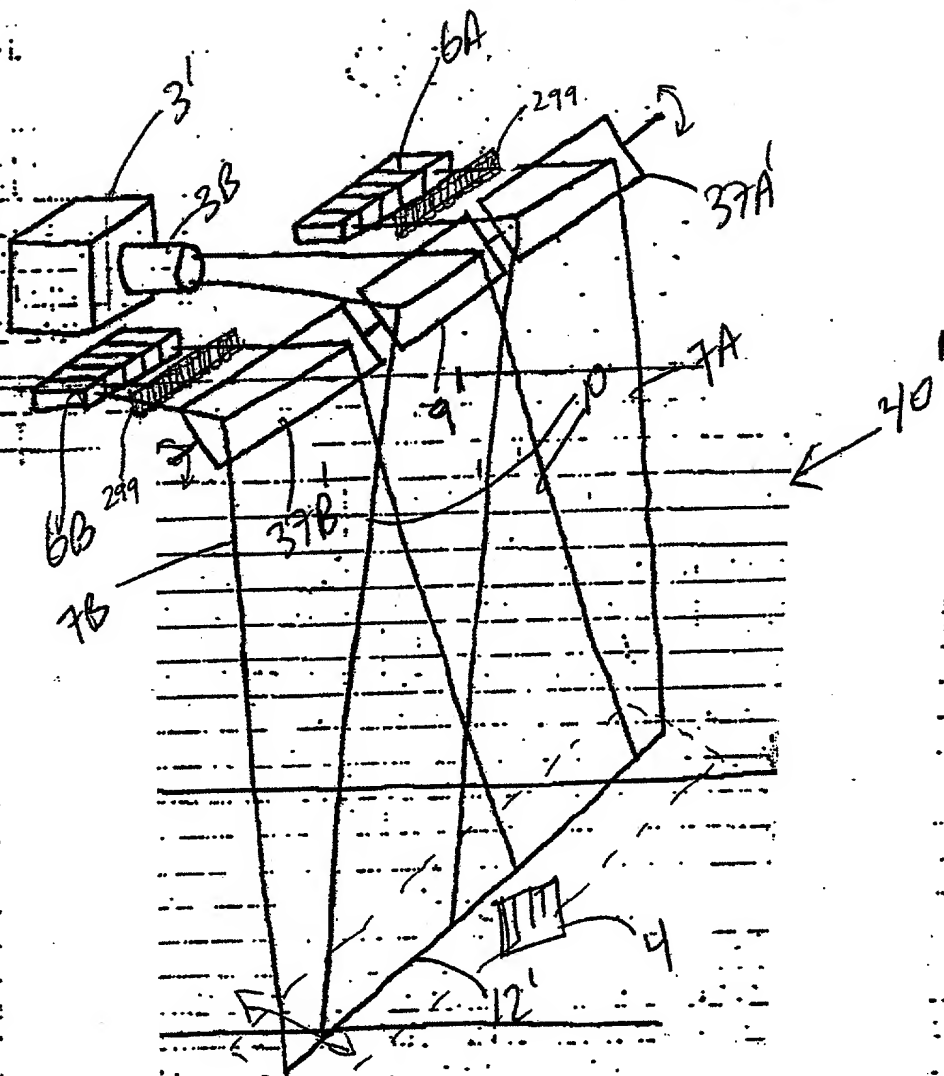


FIG 2I2

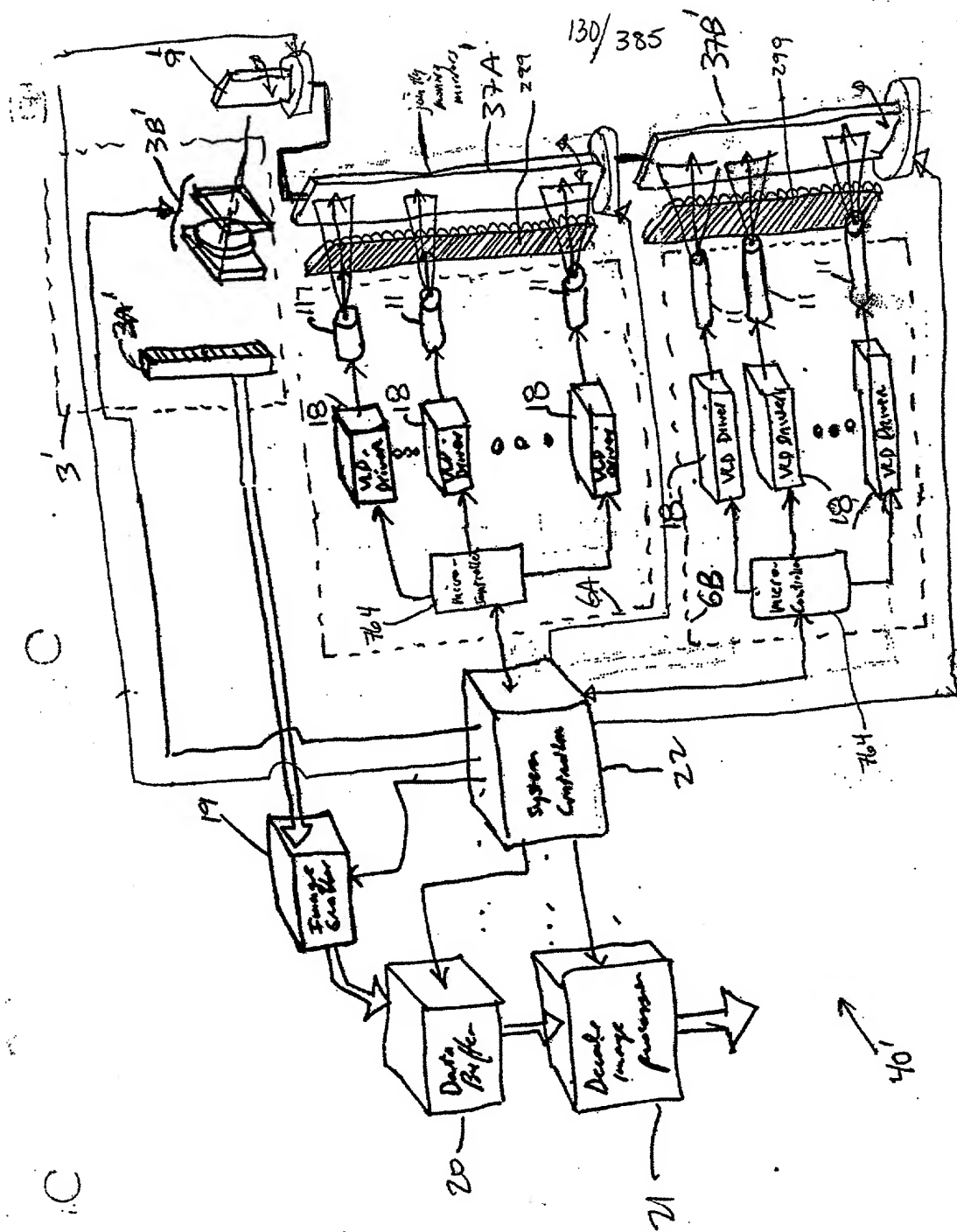


FIG. 2I3



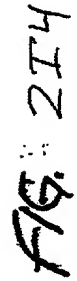


FIG. 214

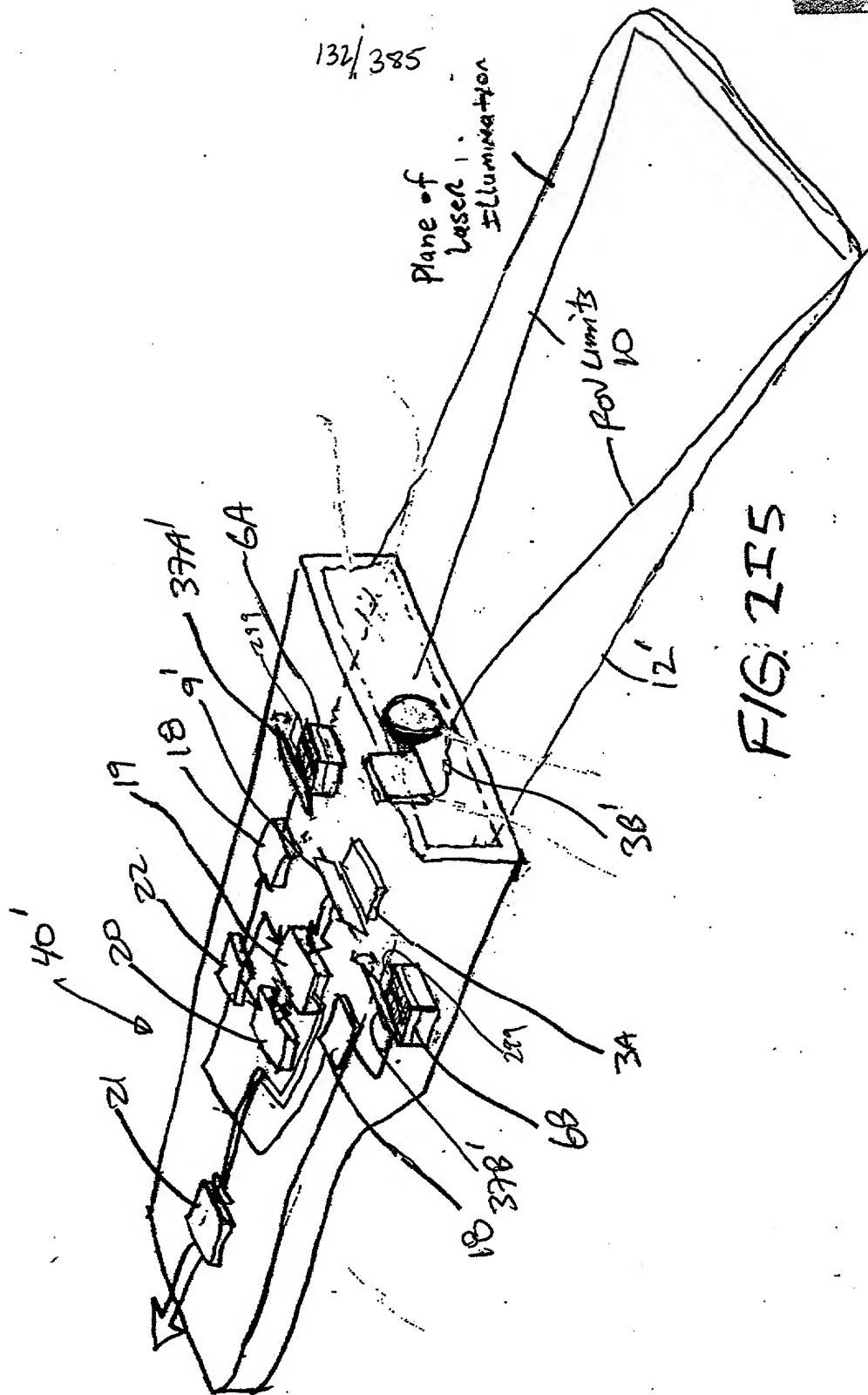


FIG. 215

133/385

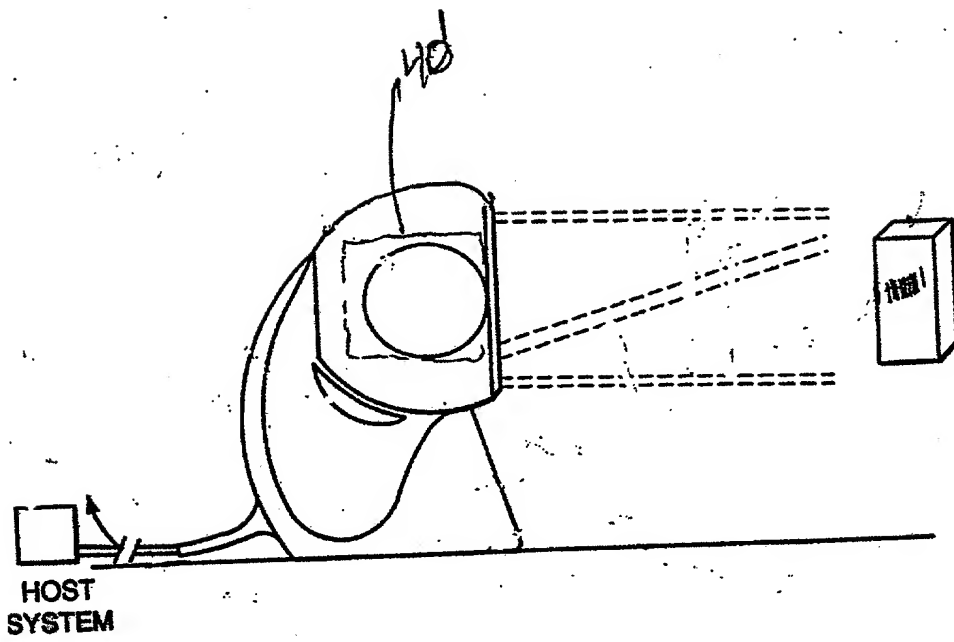


FIG. 2I6

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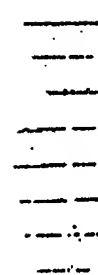


FIG. 3B1.

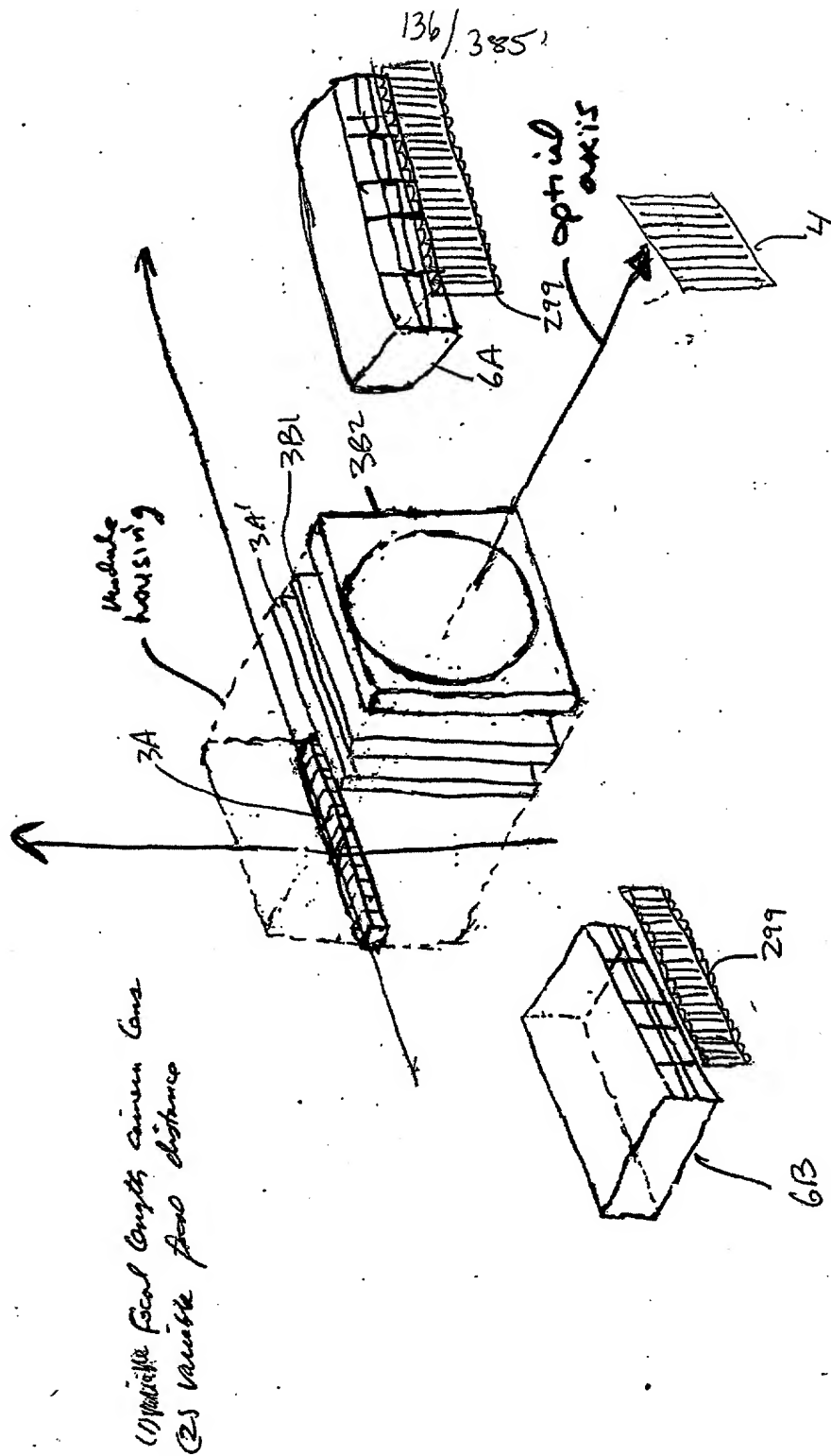
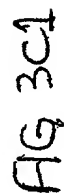


FIG. 3B2



50A

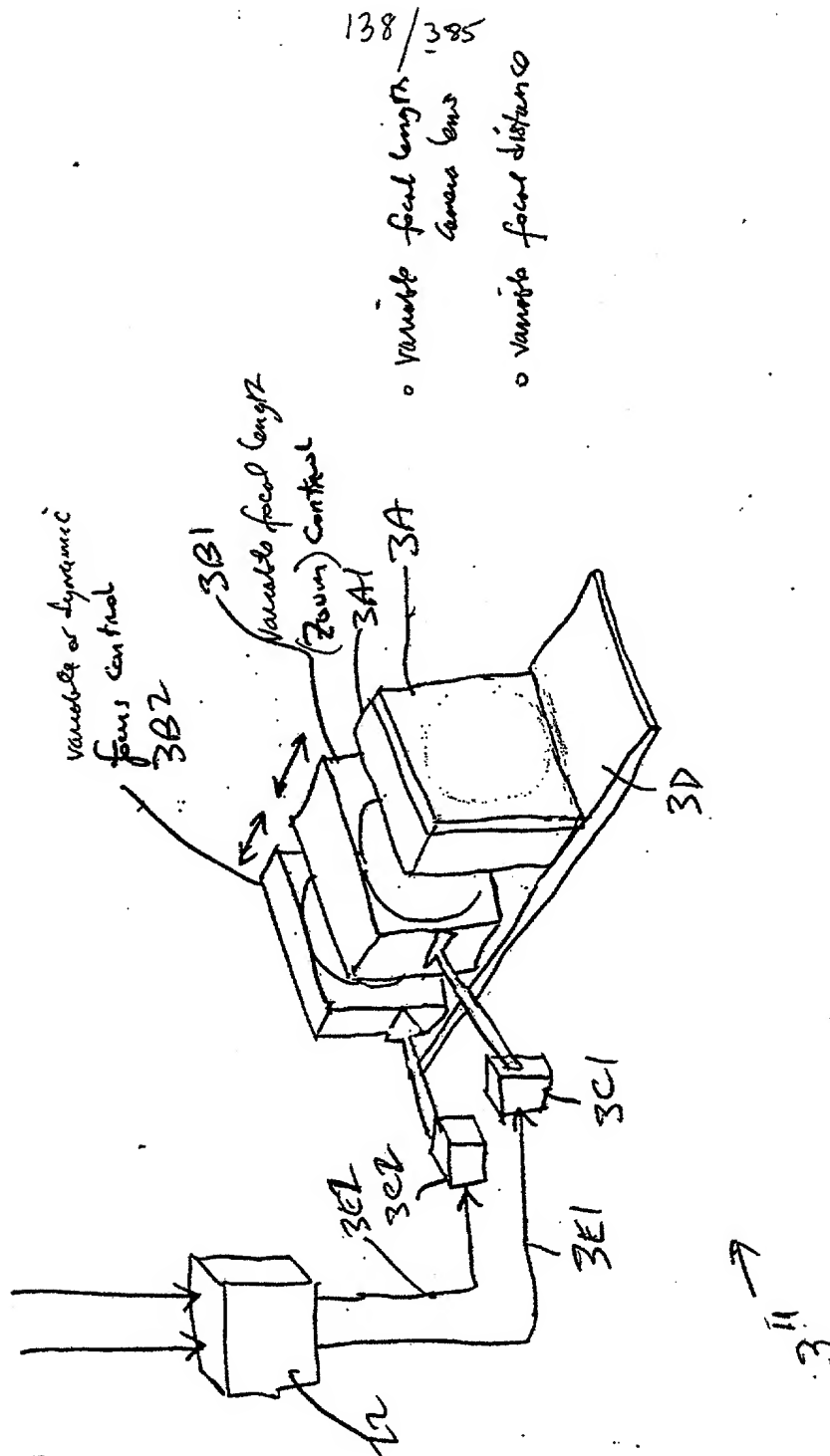
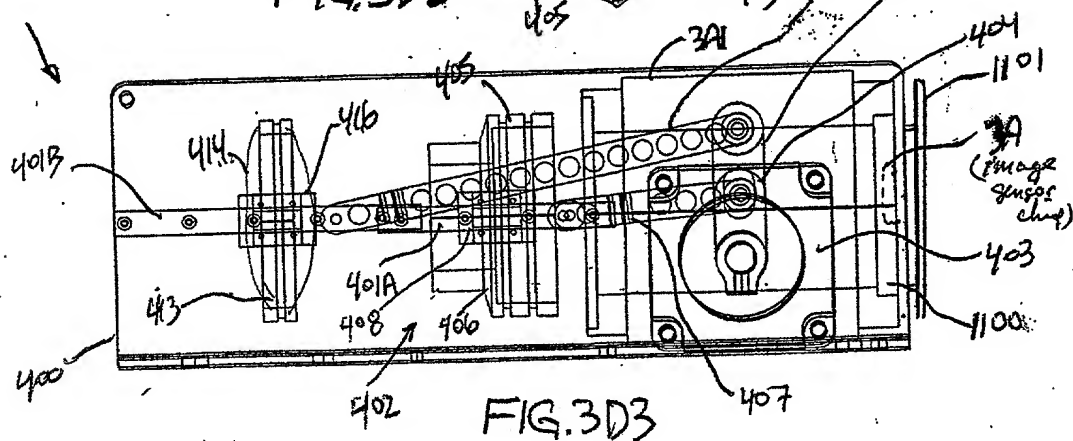
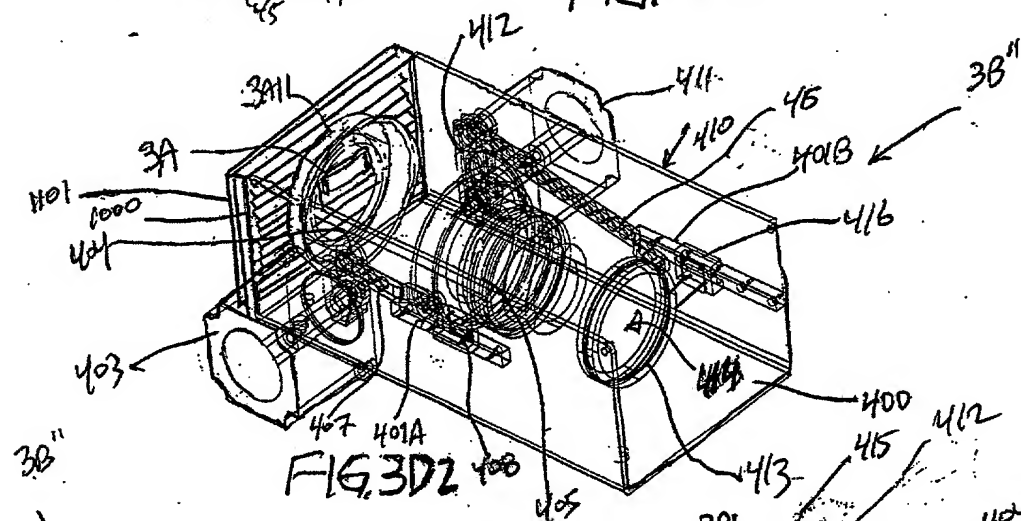
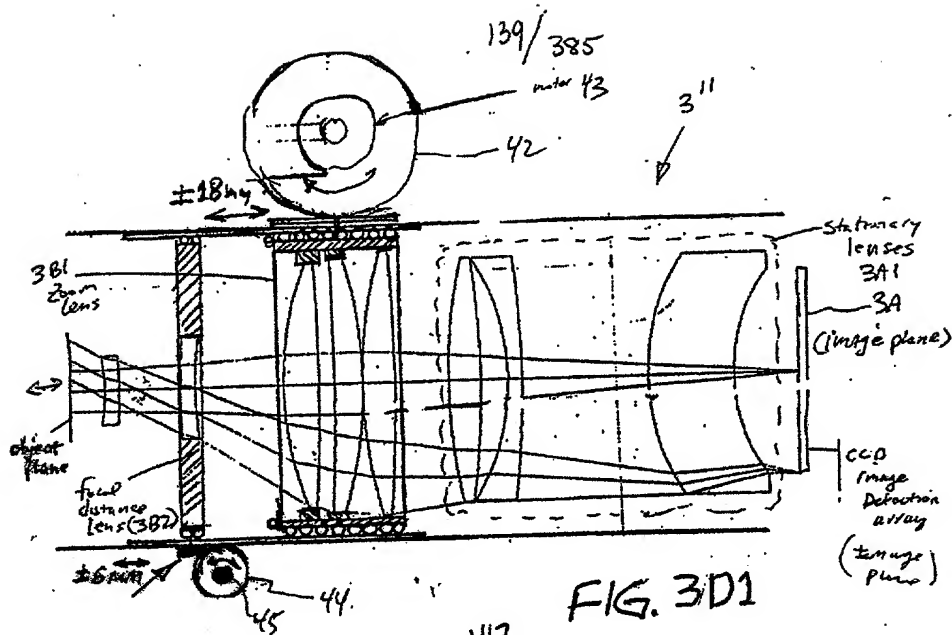


FIG. 3C2



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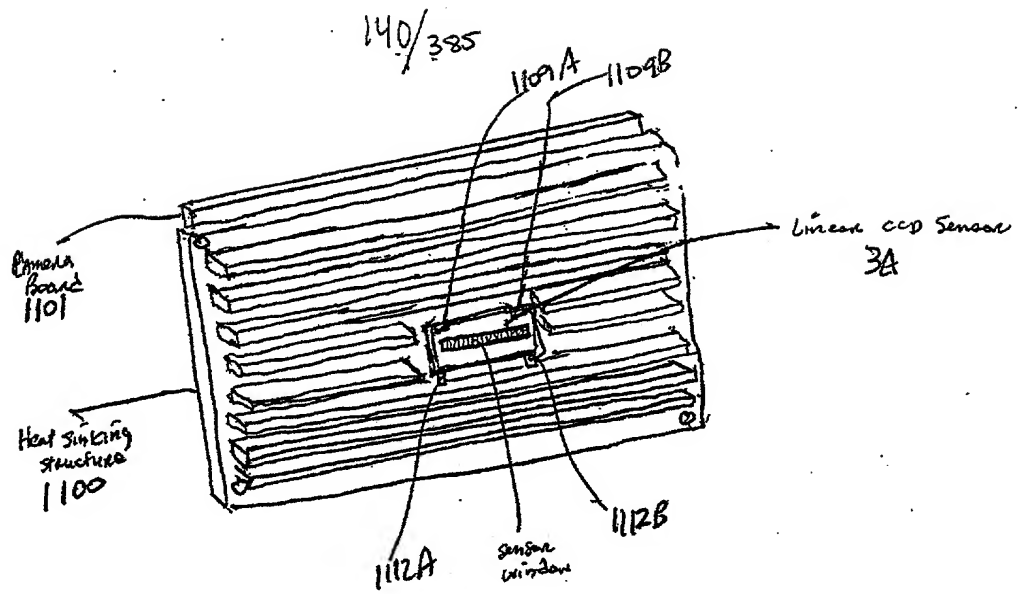


FIG. 3D4

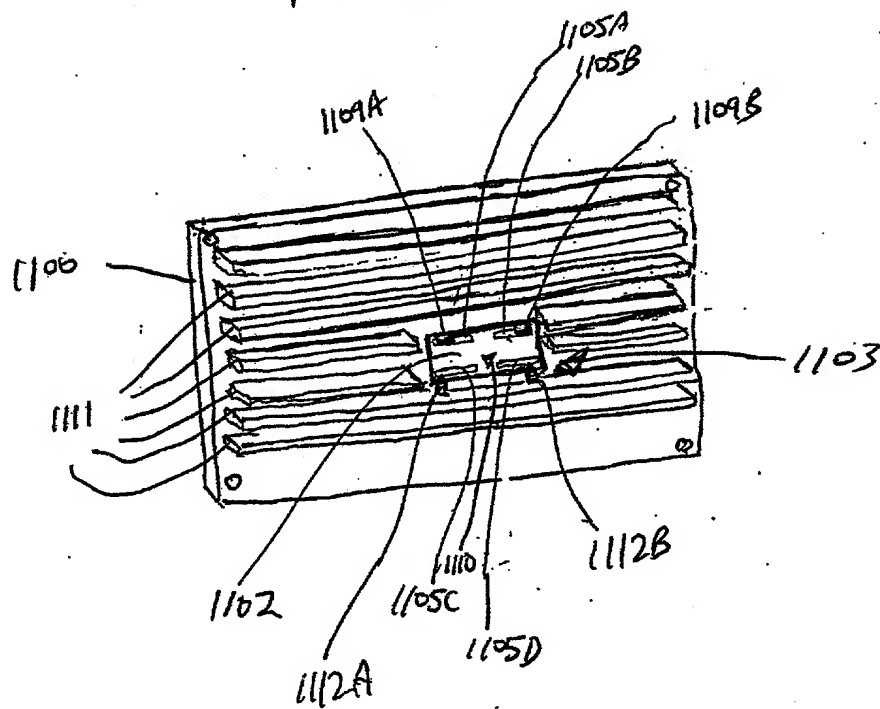


FIG. 3D5

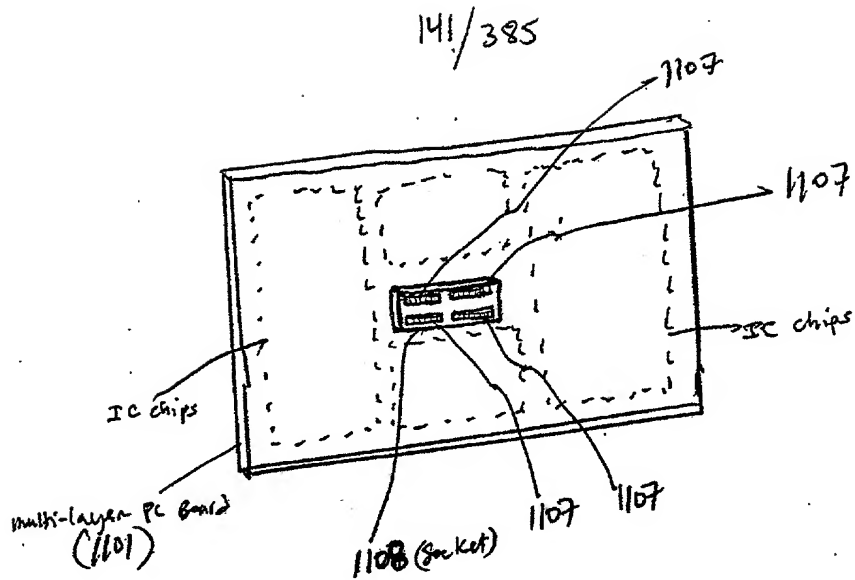


FIG. 3D6

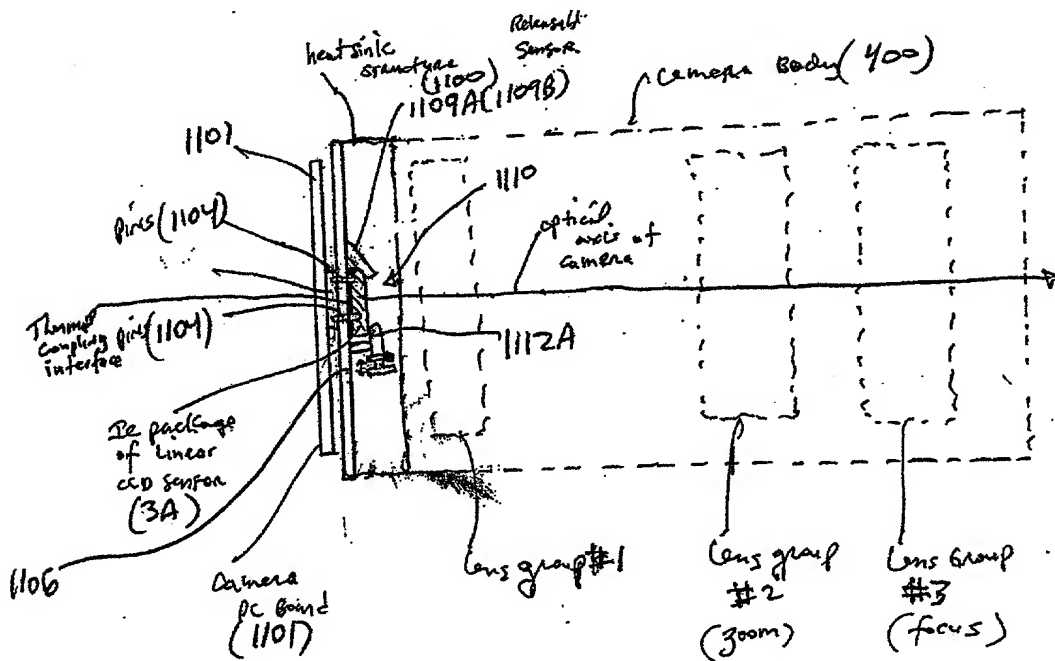
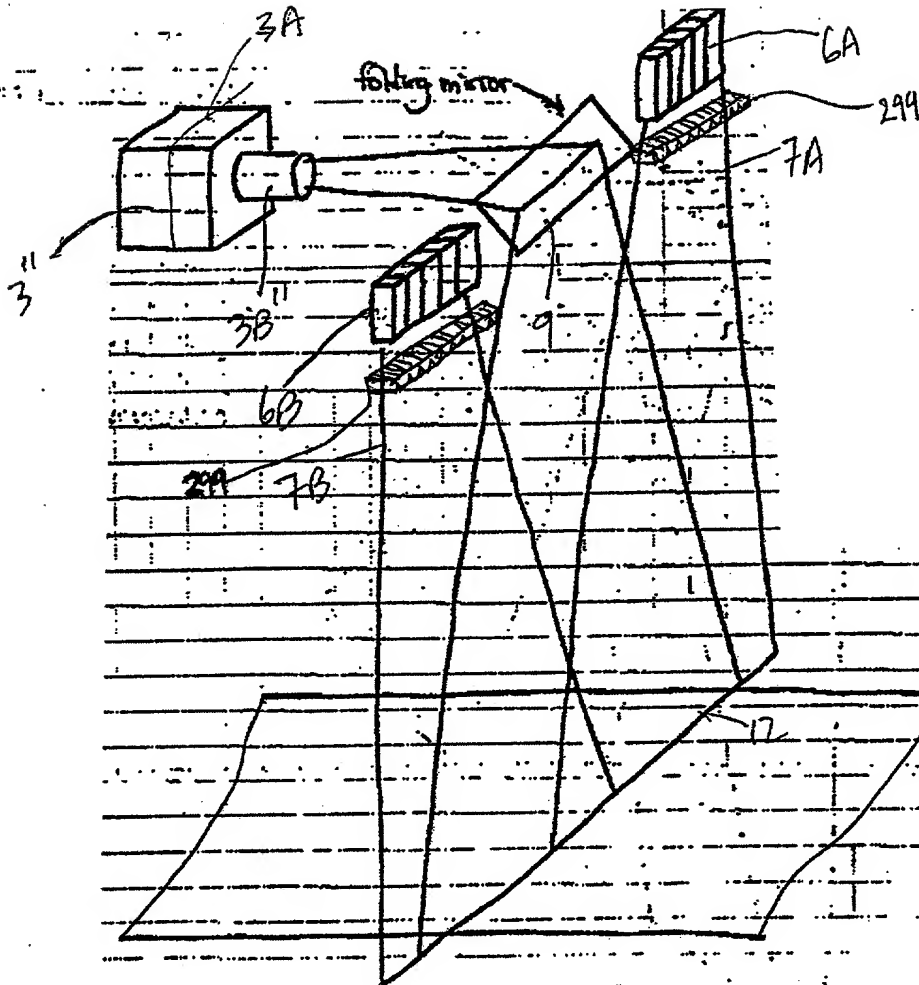


FIG. 3D7

142/385



50B

FIG. 3E1

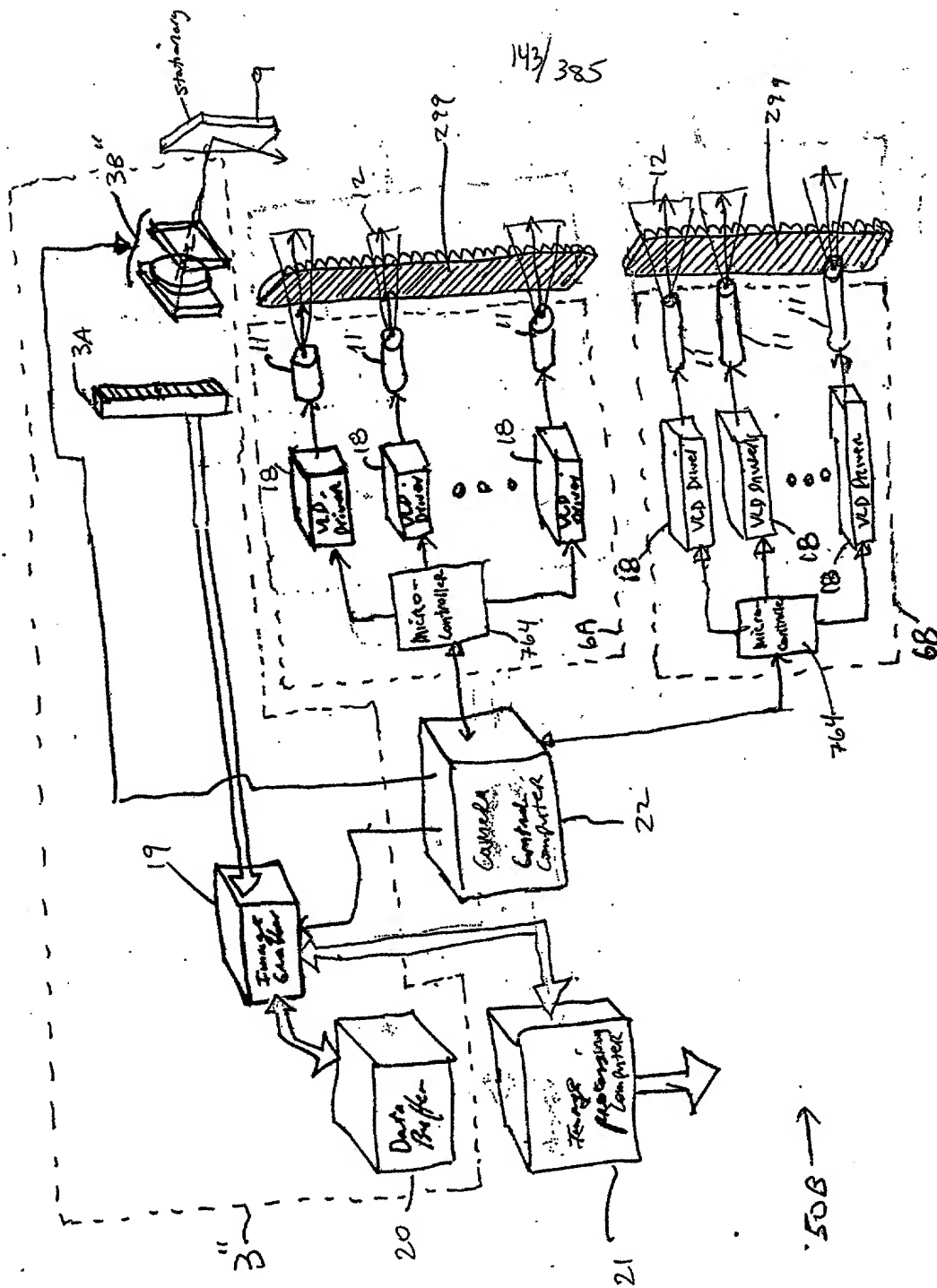


FIG. 3E2

10058463, 020702

144/385

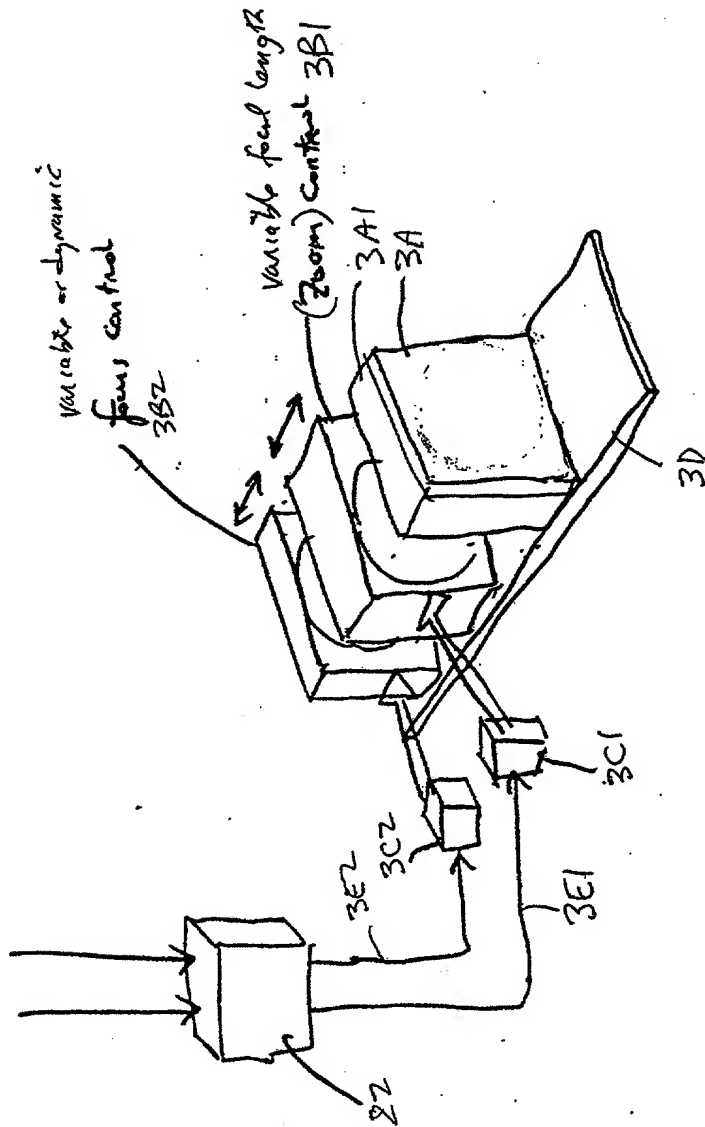


FIG. 3E3

145/385)

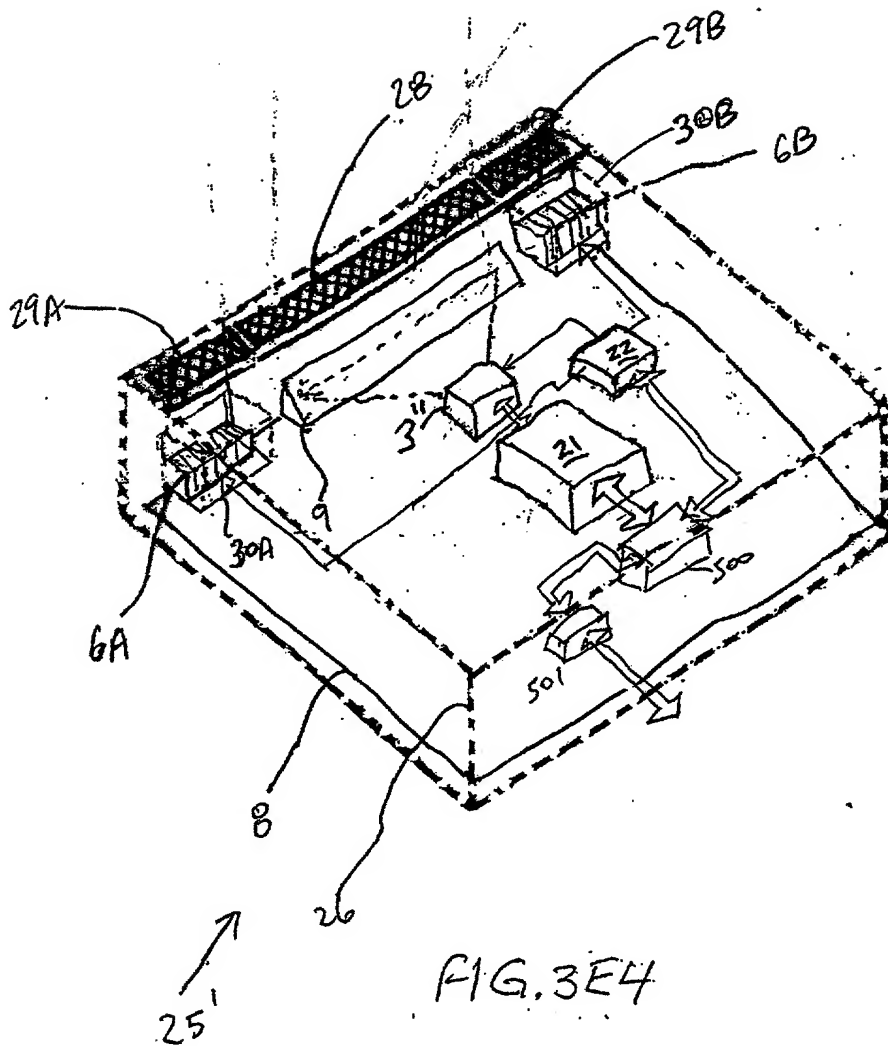


FIG. 3E4

10068462.020702

146/385

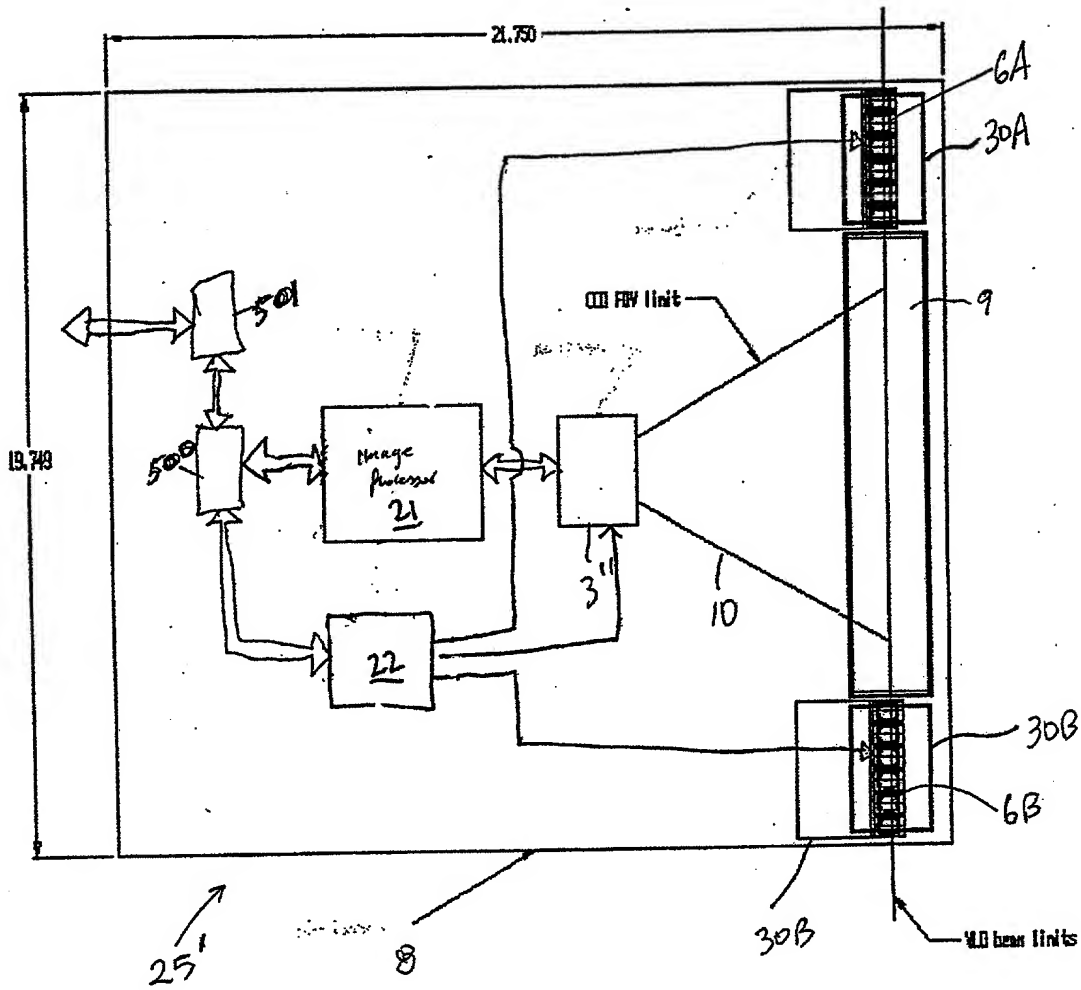


FIG. 3E5



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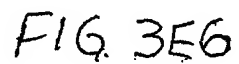


FIG. 3E6

148/385

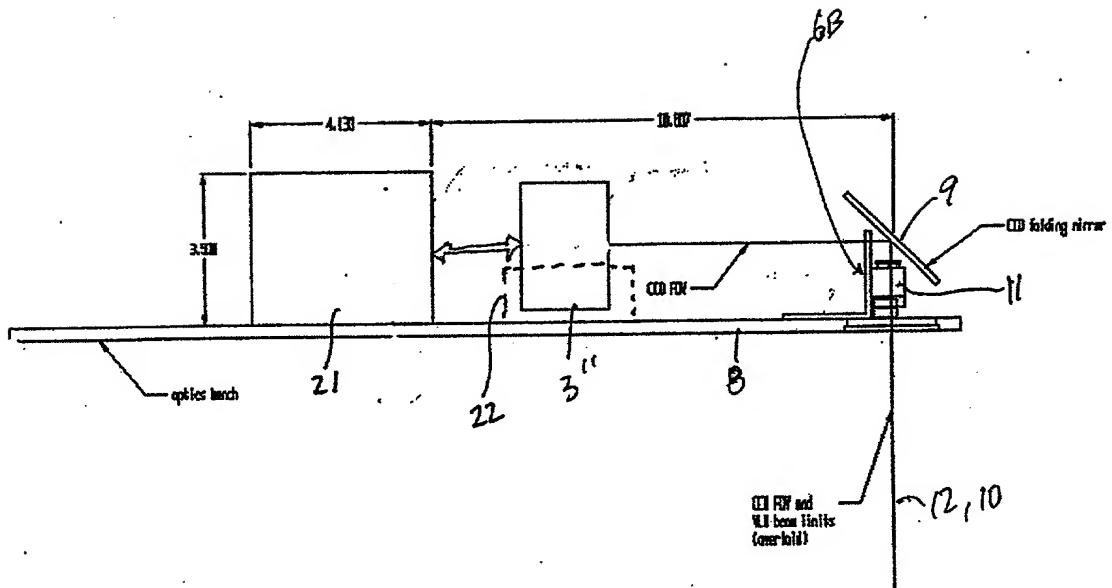


FIG. 3E7

149/385

\*Variable FOV

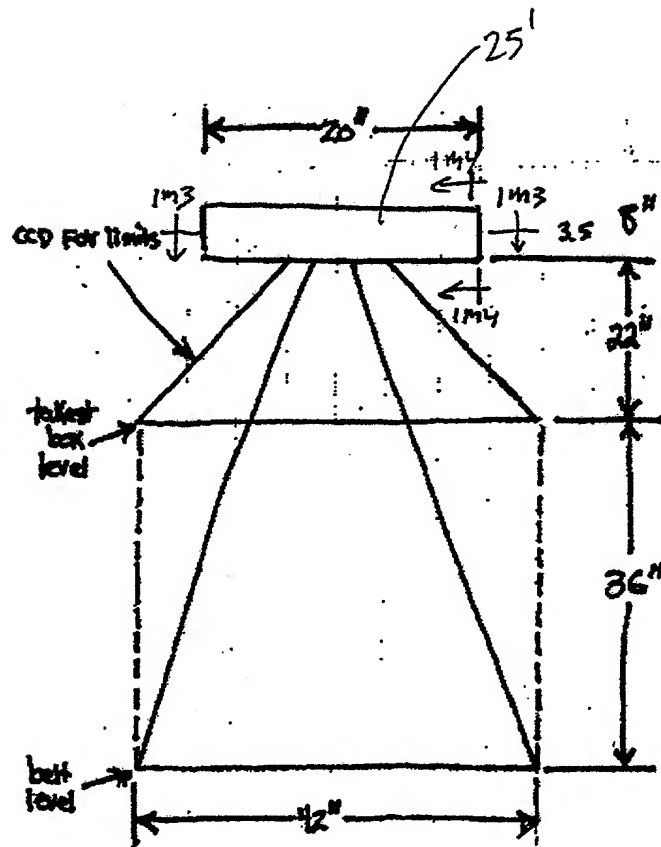


FIG. 3E8

10068452.020702

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150/385

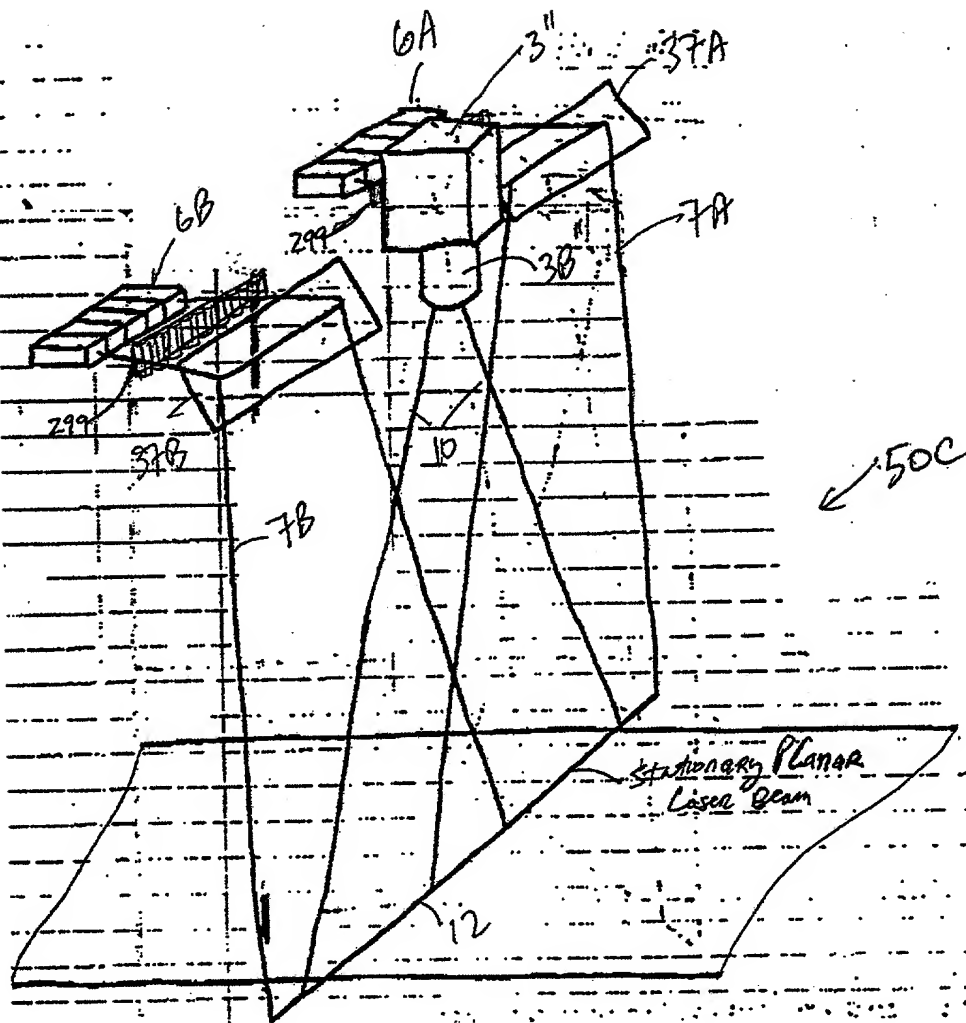
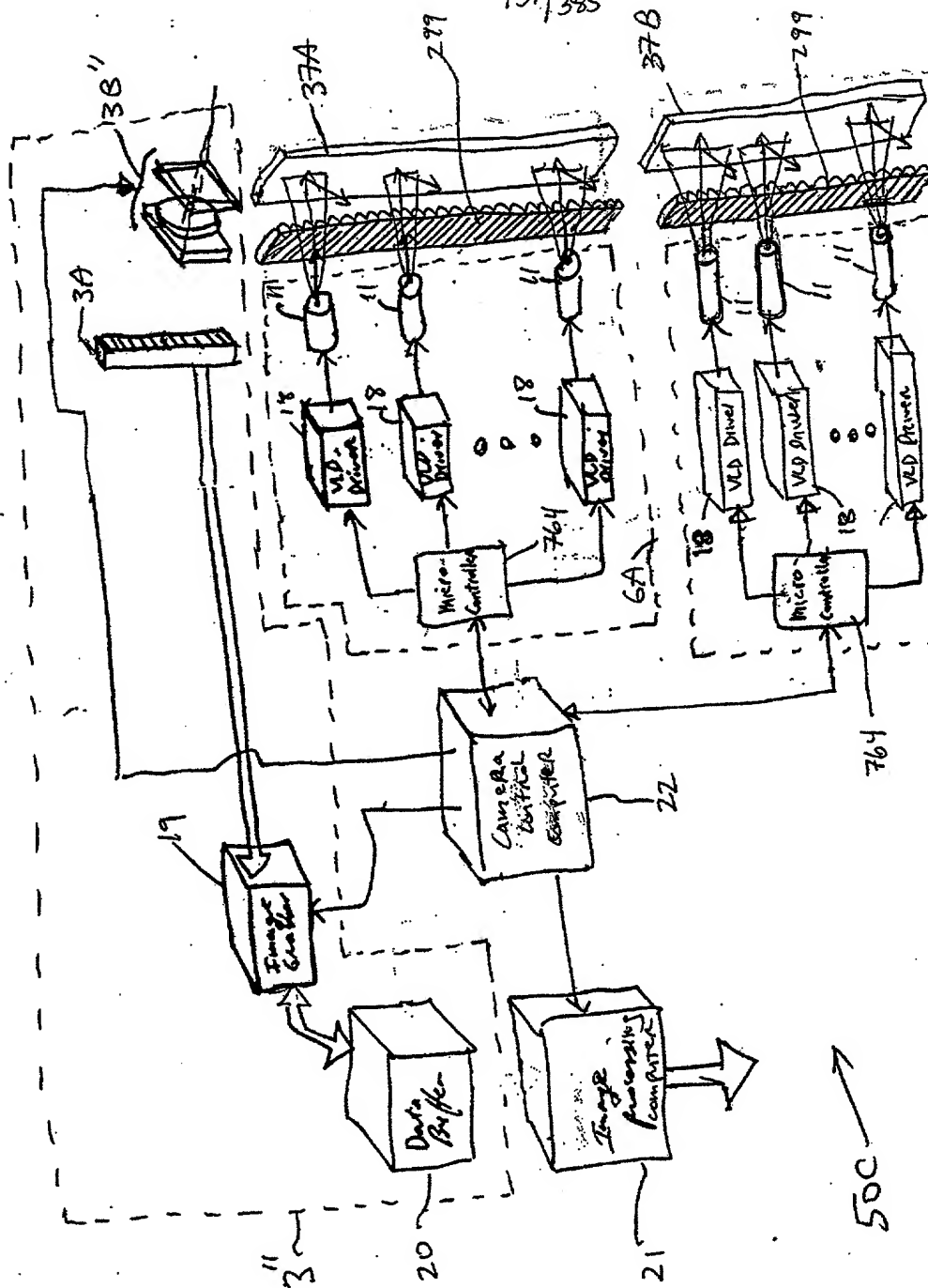


FIG 3F1



152/385

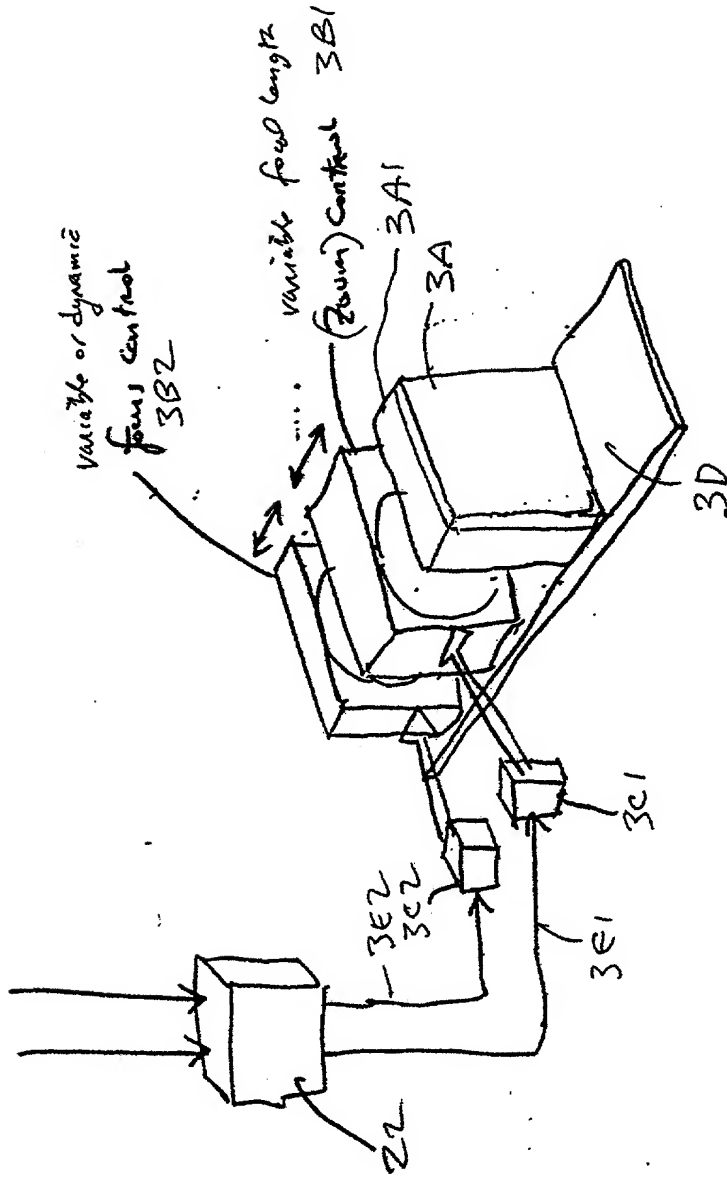


FIG. 3F3

10058462.020702

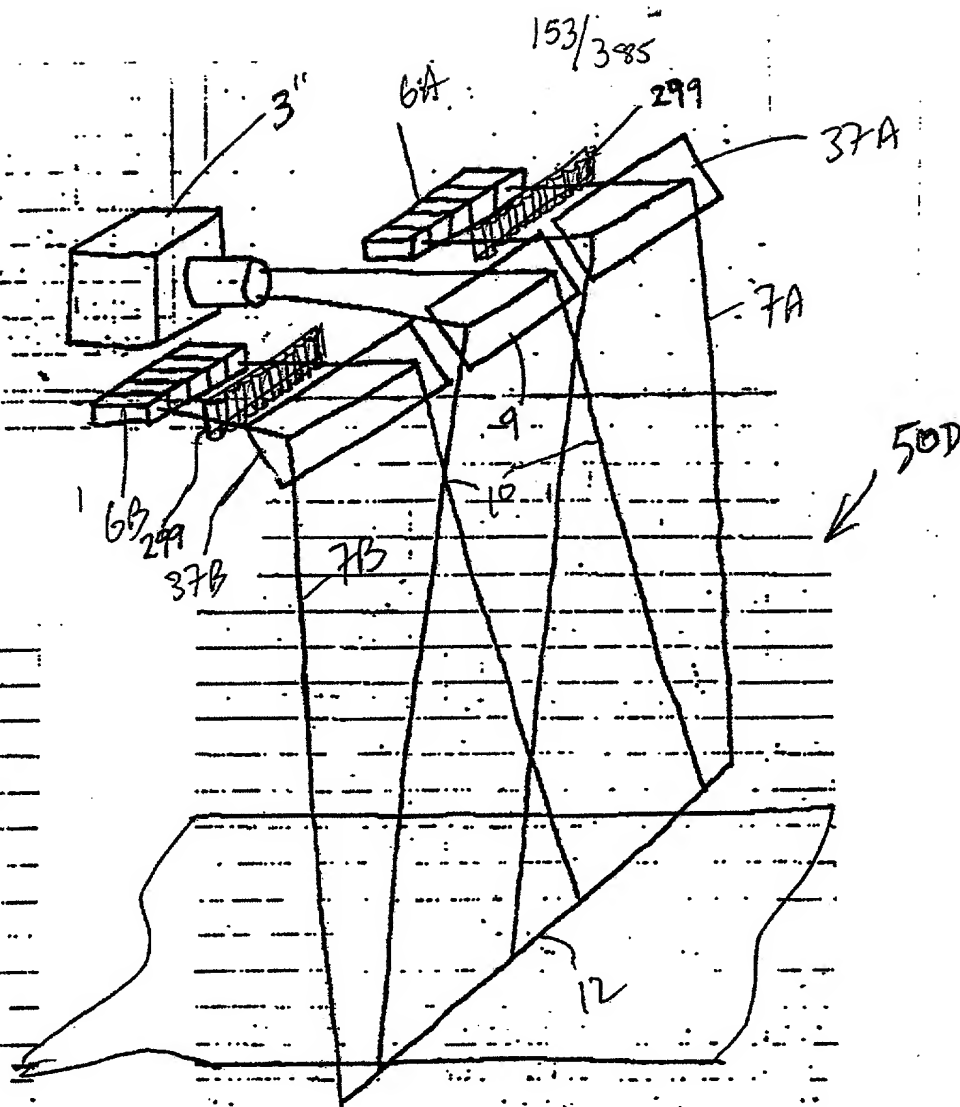


FIG. 351

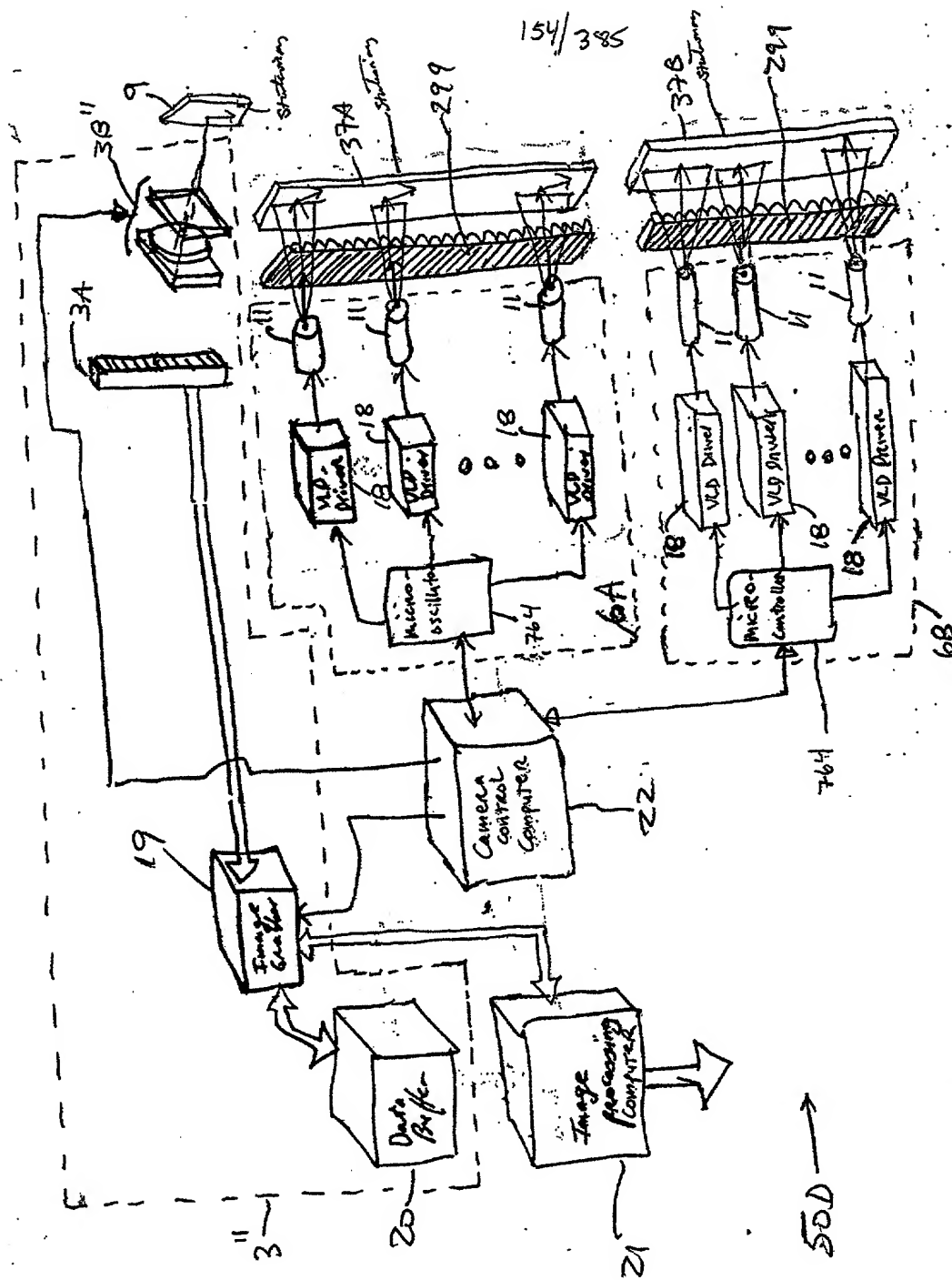


FIG. 392



155/385

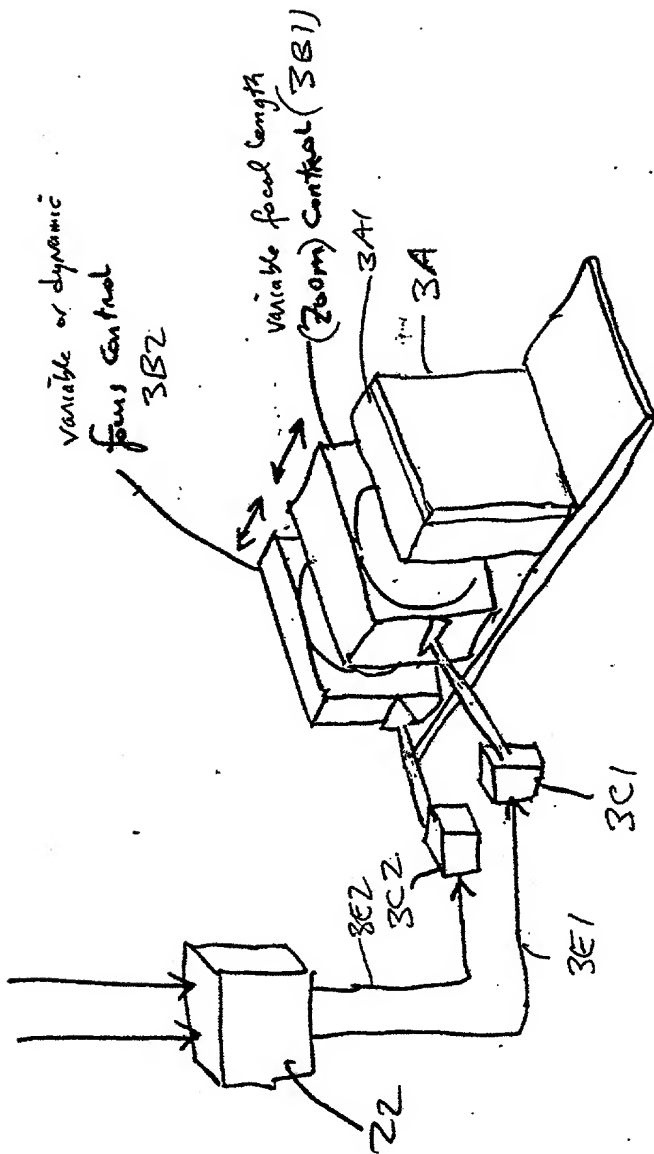
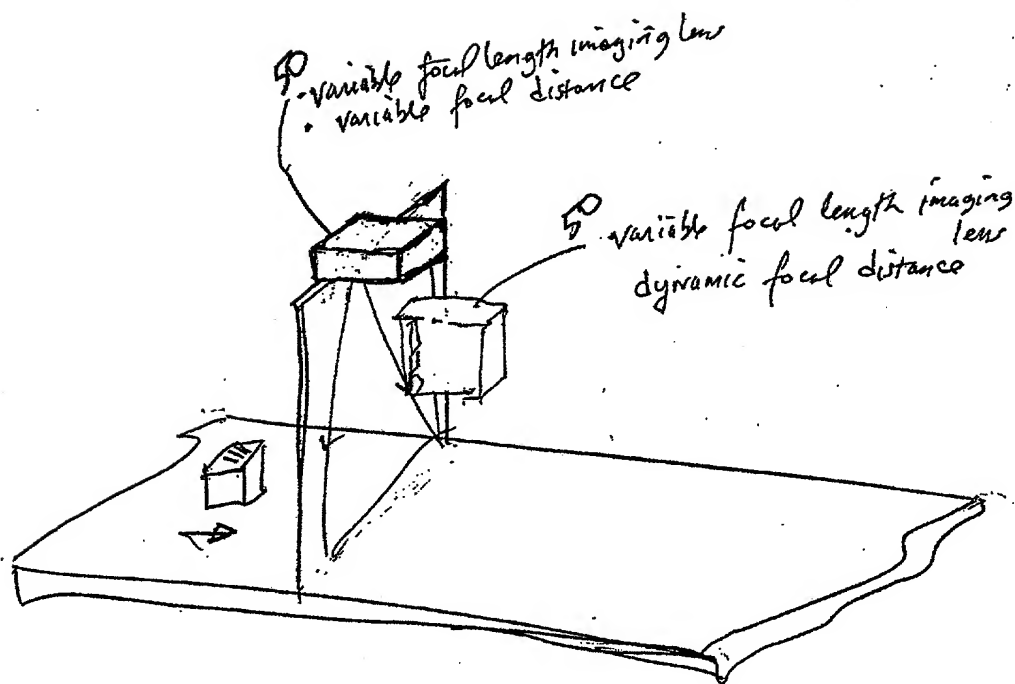


FIG. 393

3''

156/385

10058452.000702



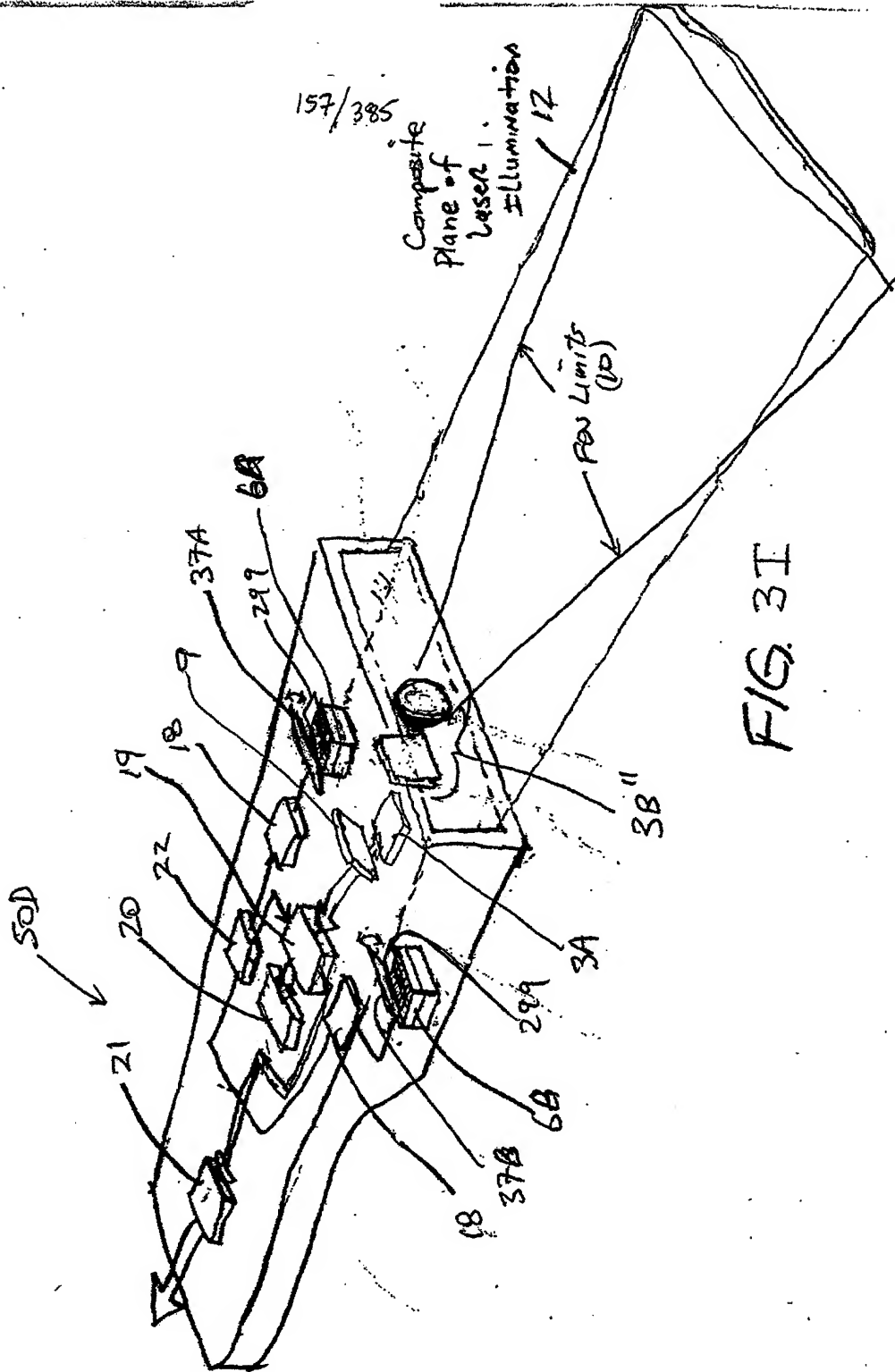


FIG. 3I

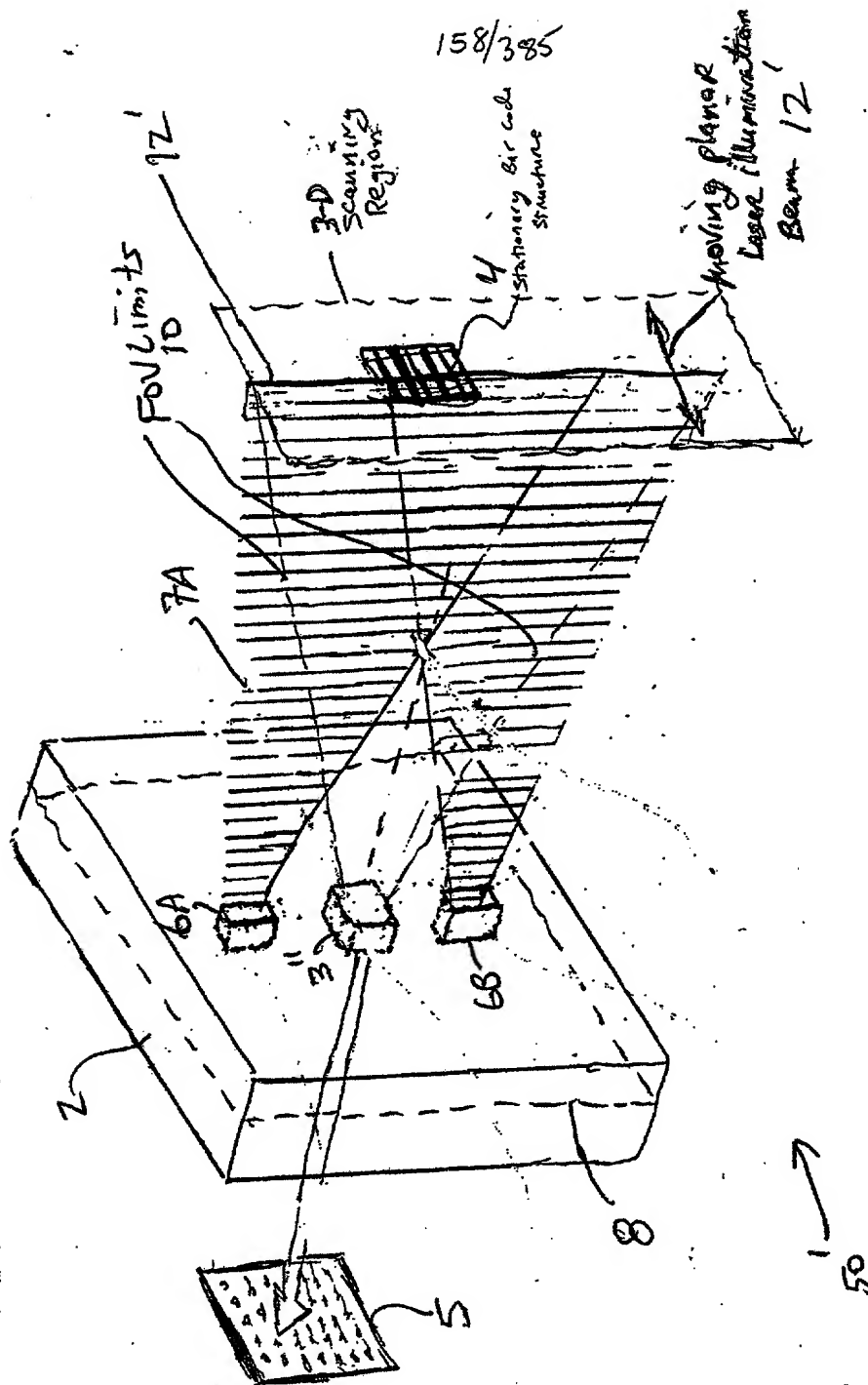


FIG. 3J1

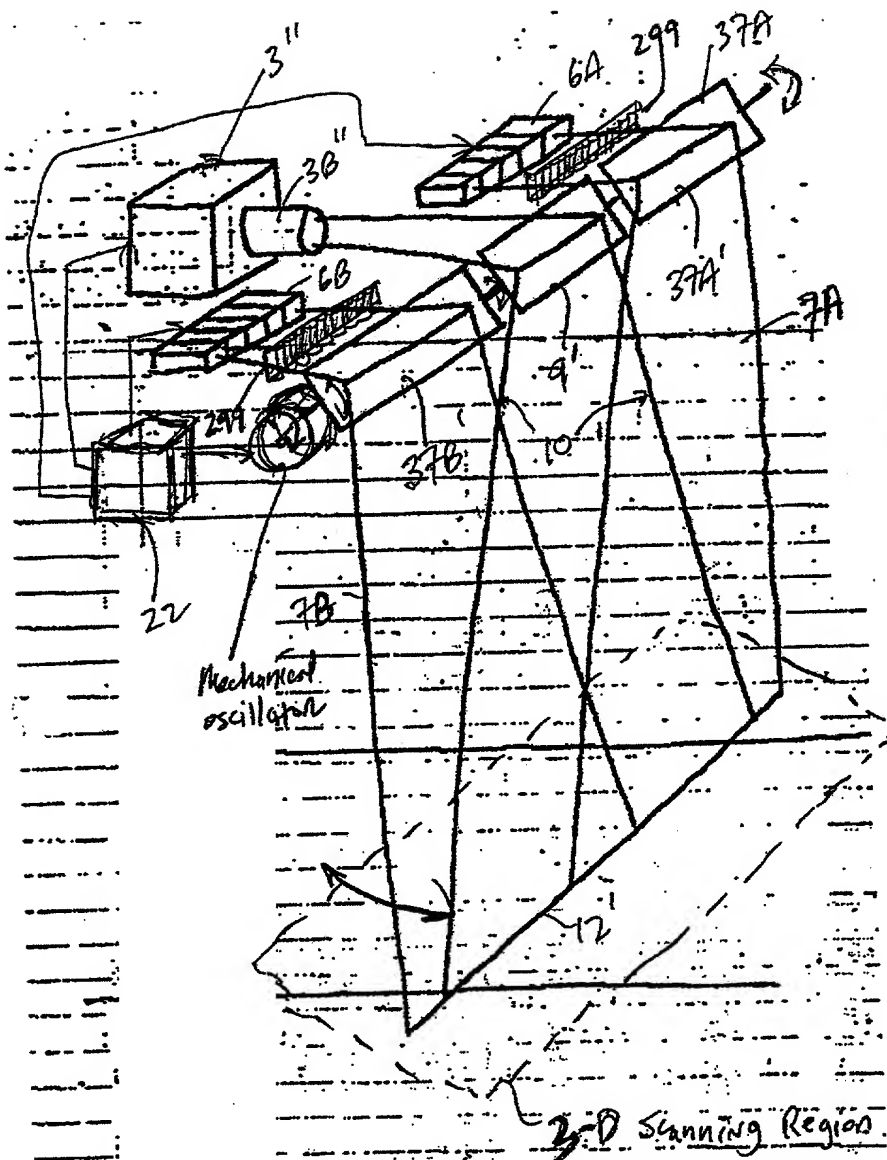


FIG. 3JZ

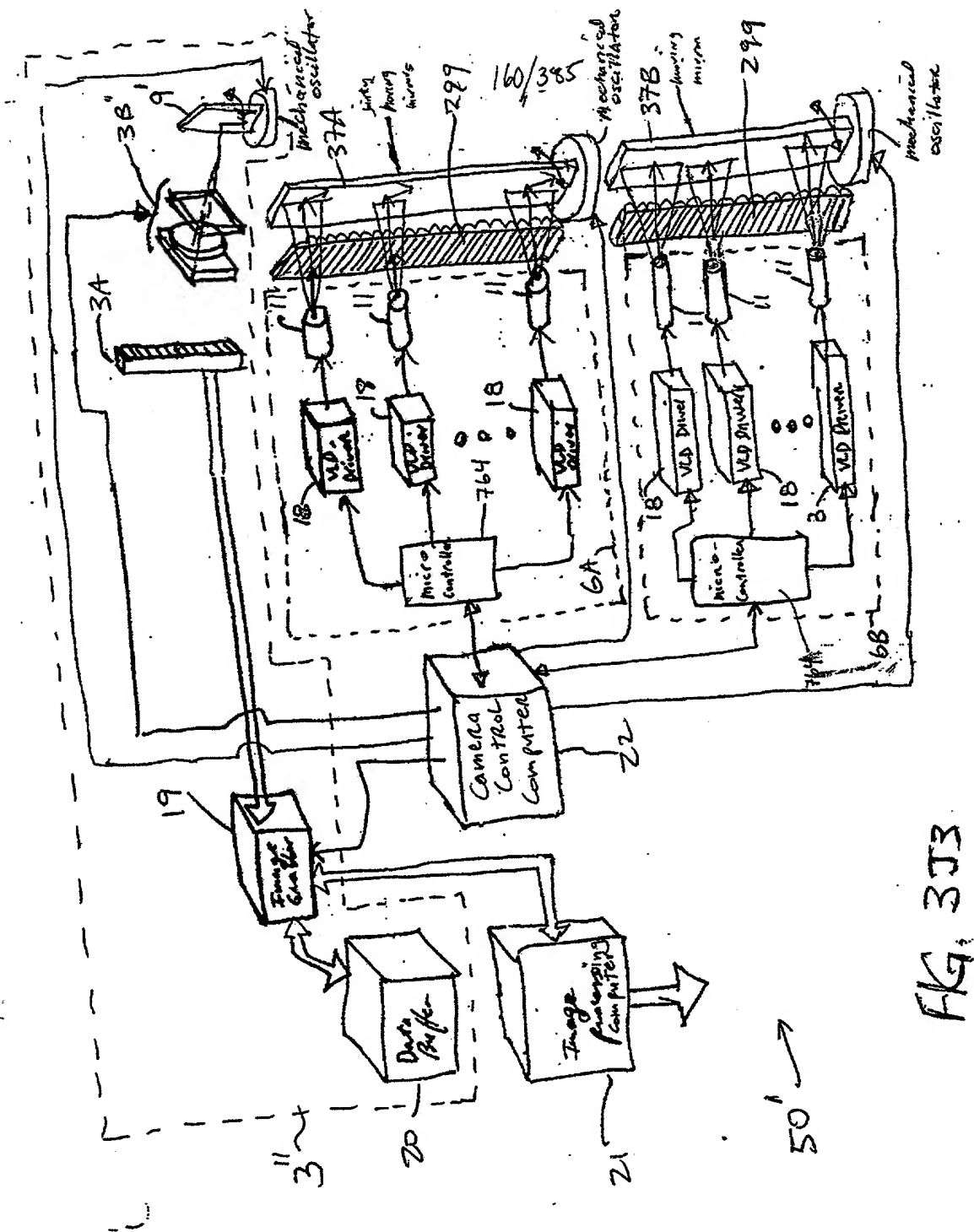


FIG. 3J3

161/385

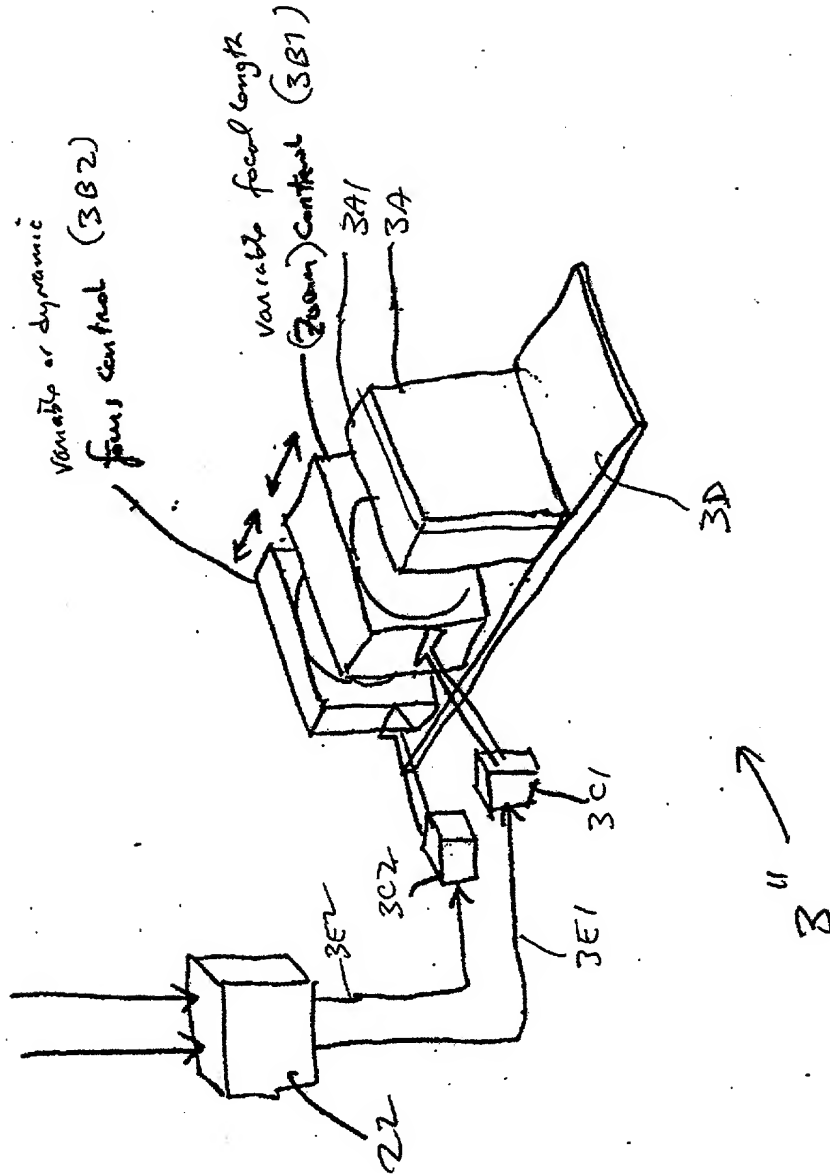
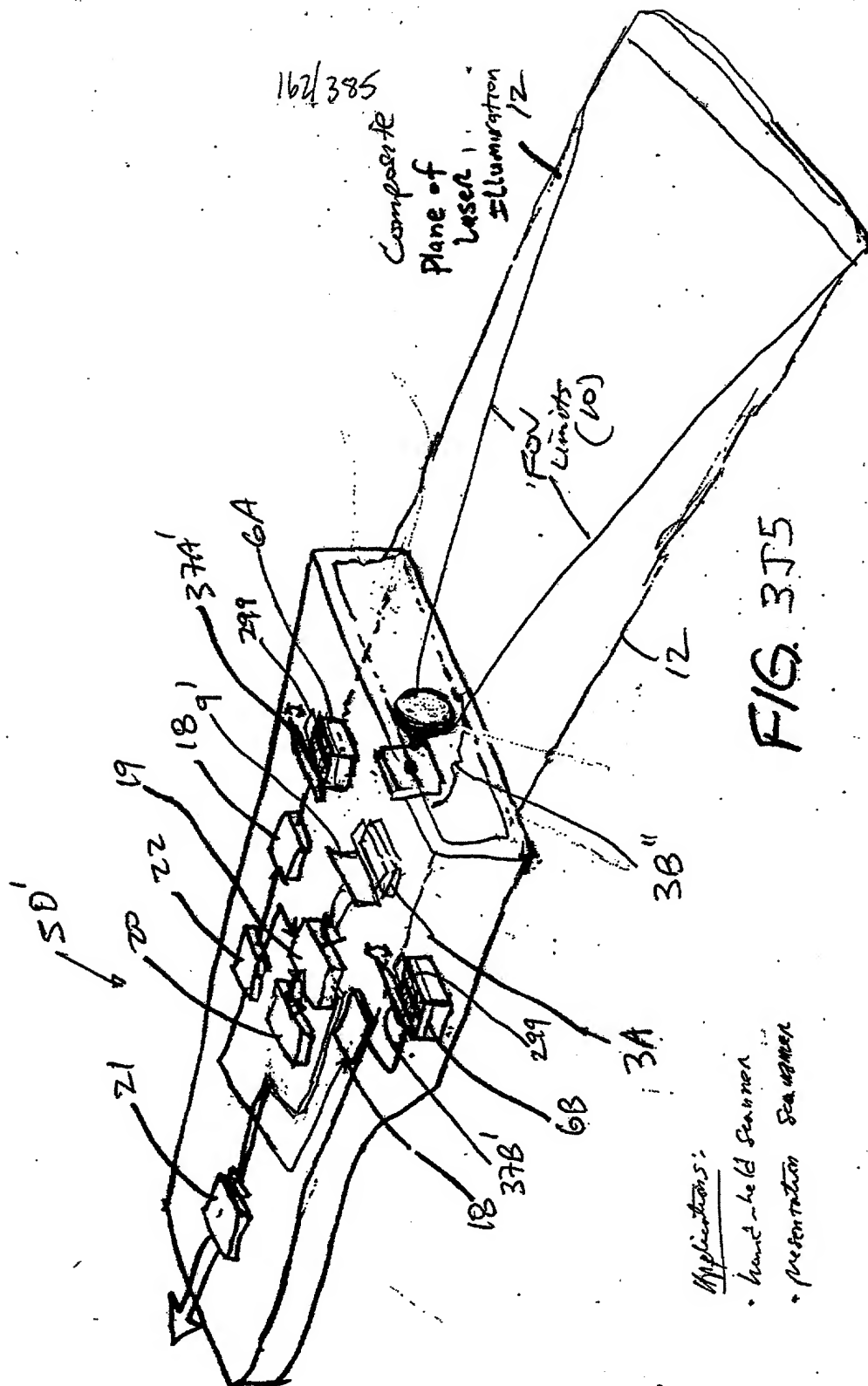


FIG. 3J4





163/385

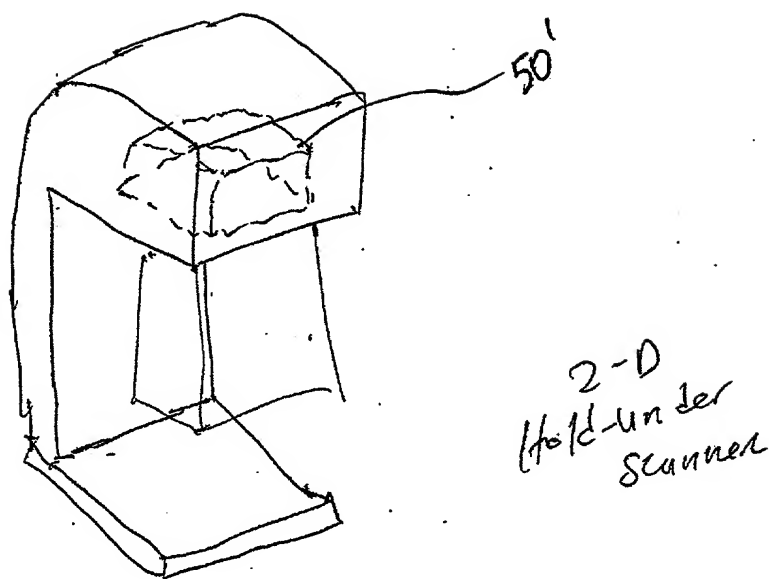


FIG-316

202020125489001

CC

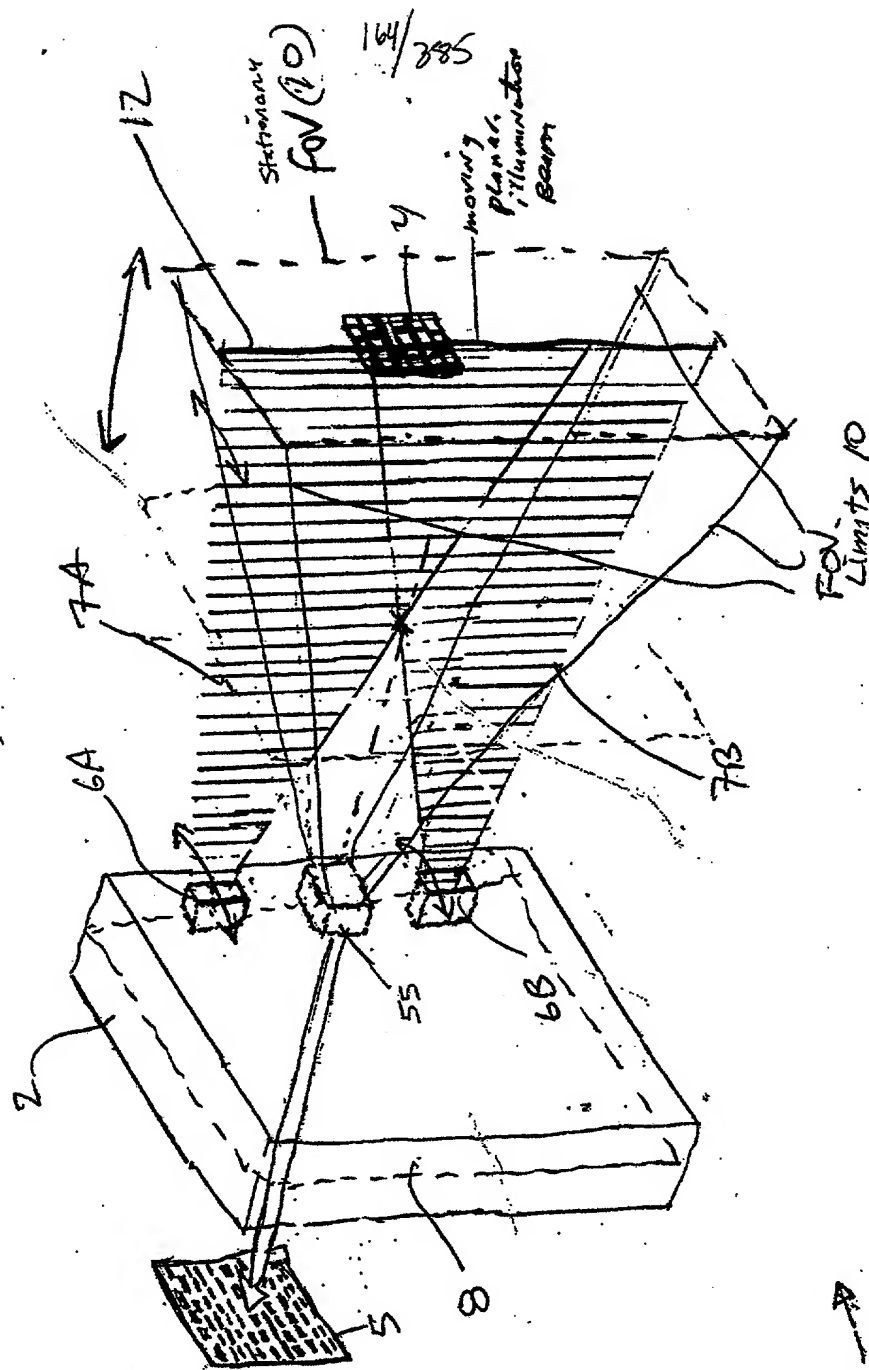


FIG 4A

1165/385

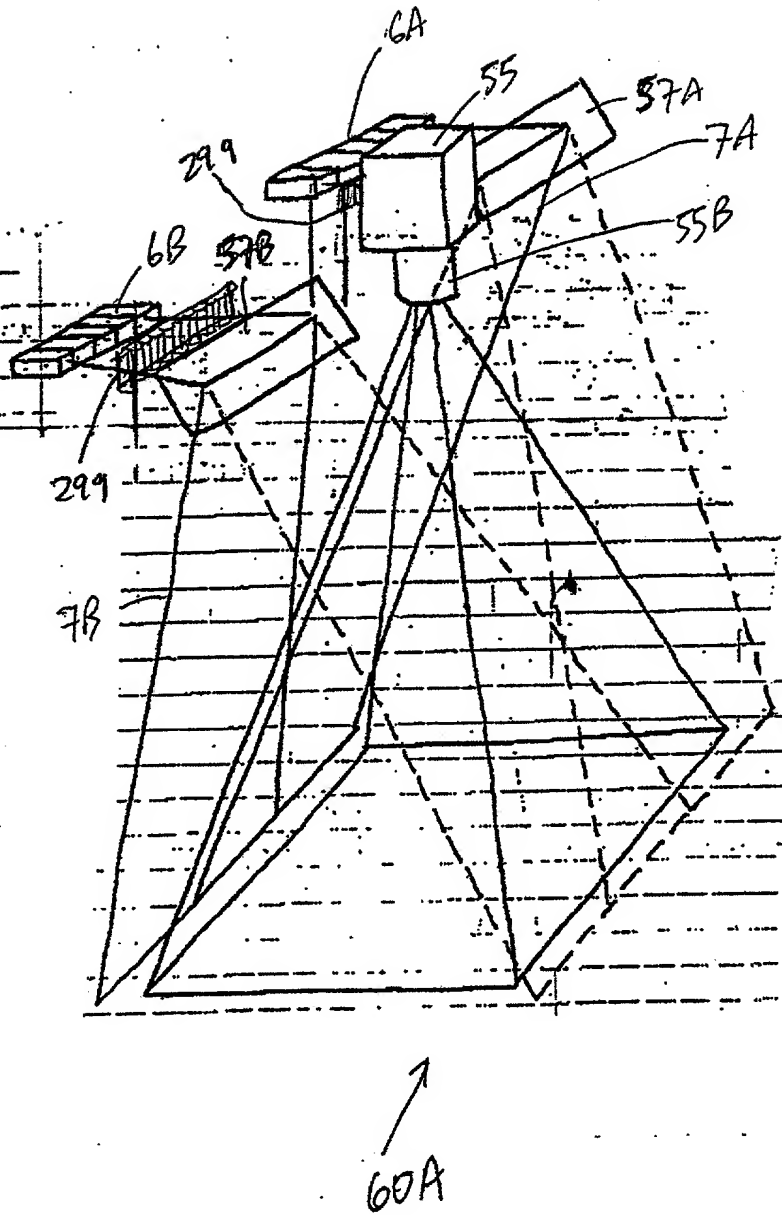


FIG. 4B1

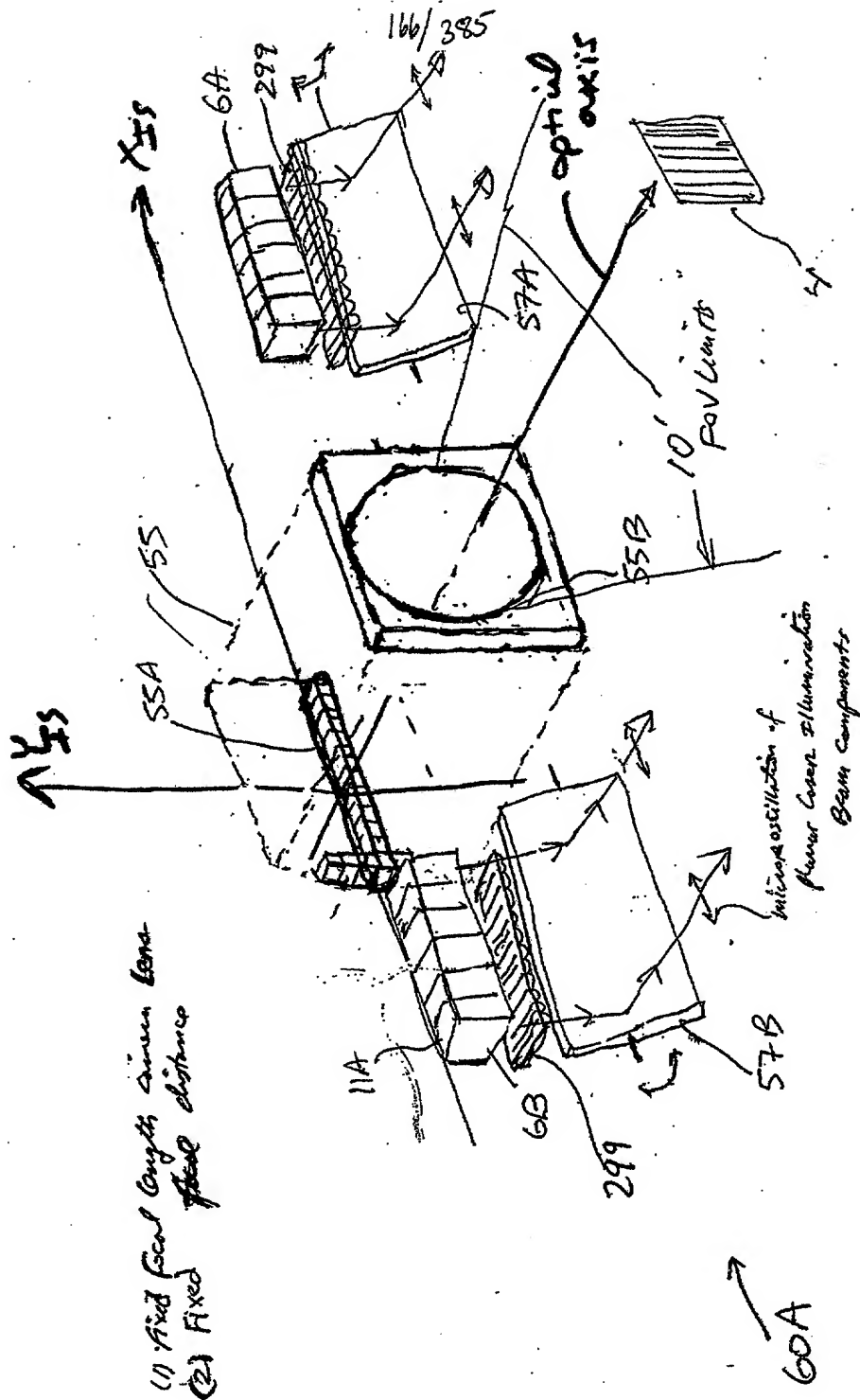
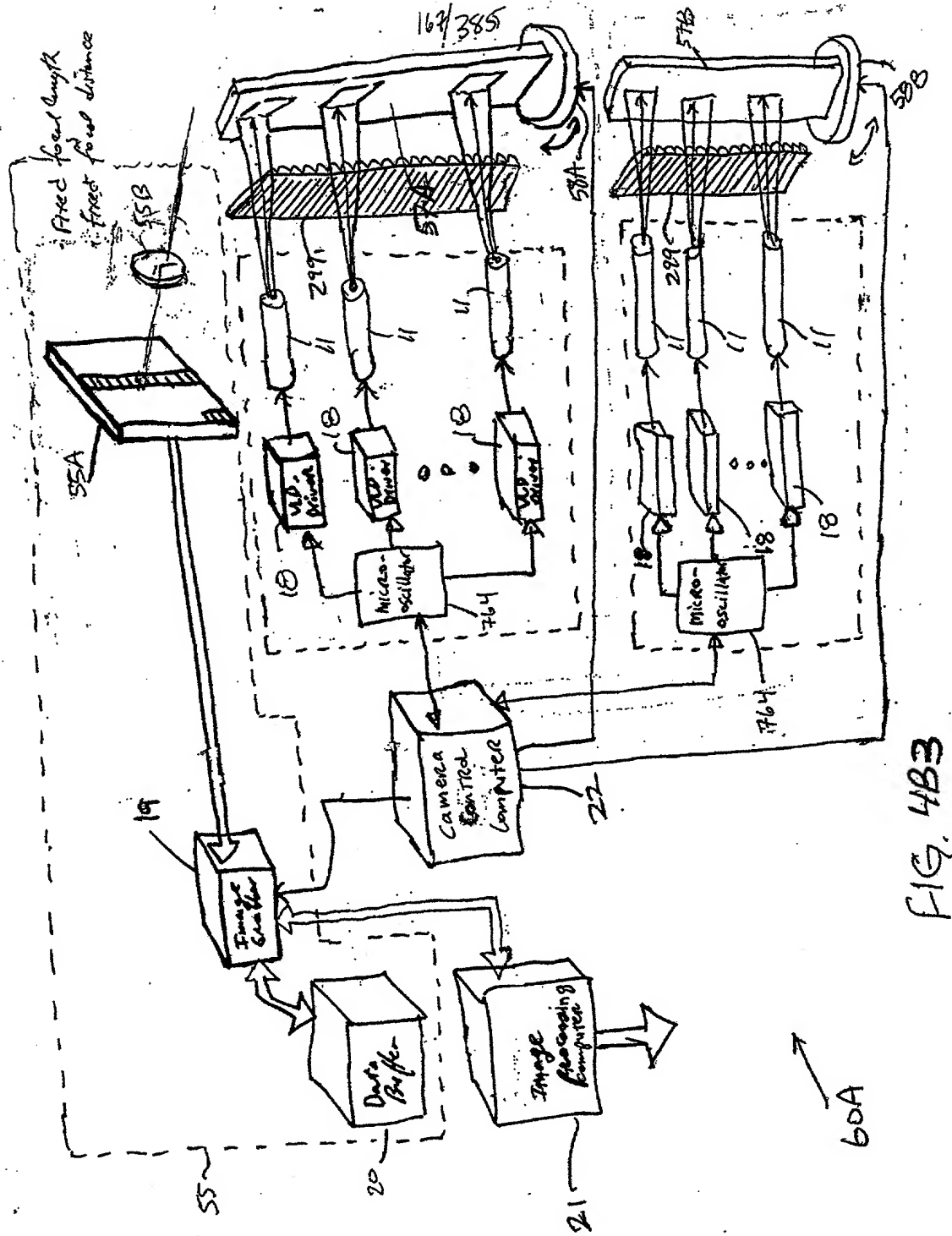


FIG. 4BZ

202020" 23435001



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168/385

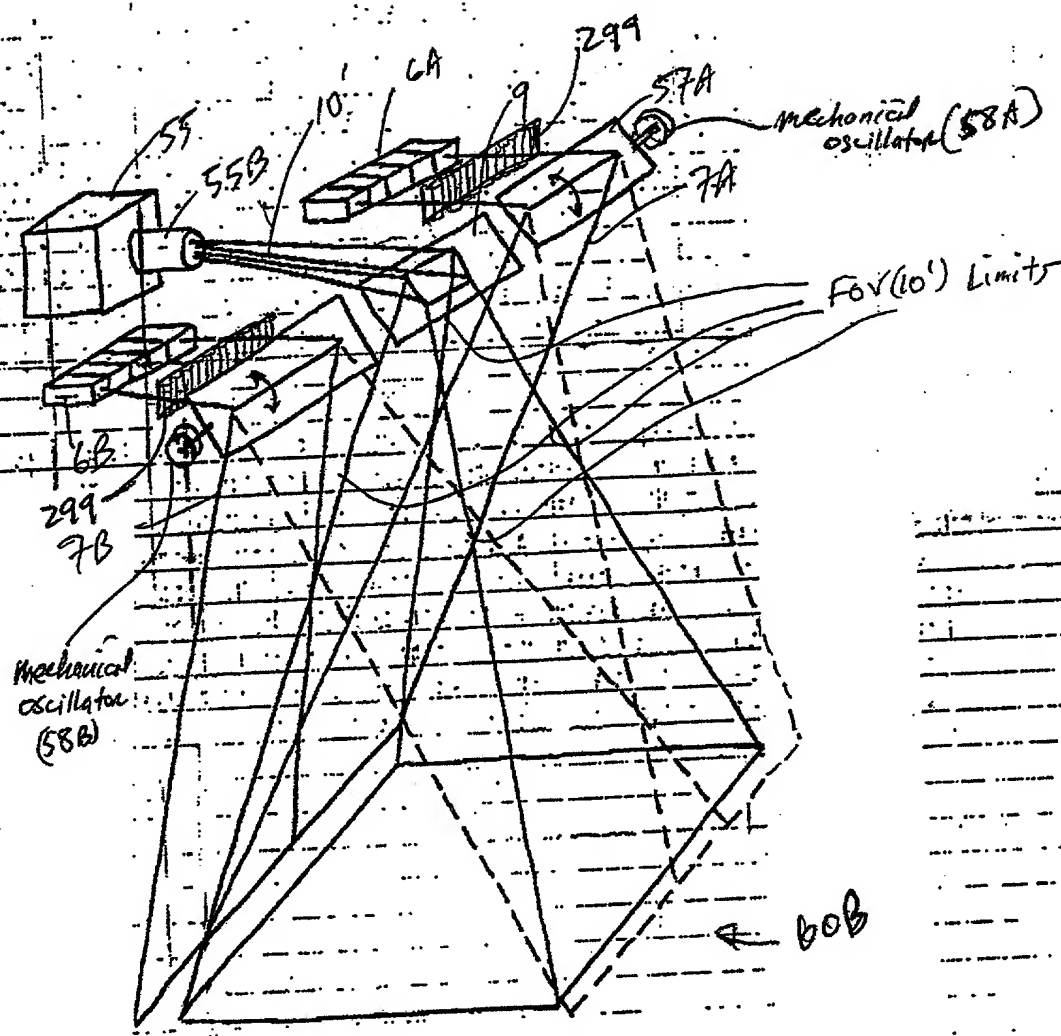


FIG 4C1



170/385

20200229489001

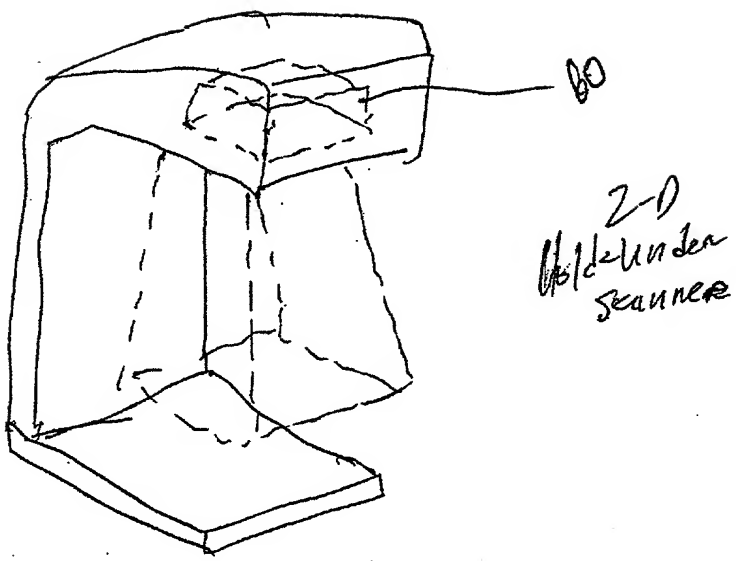
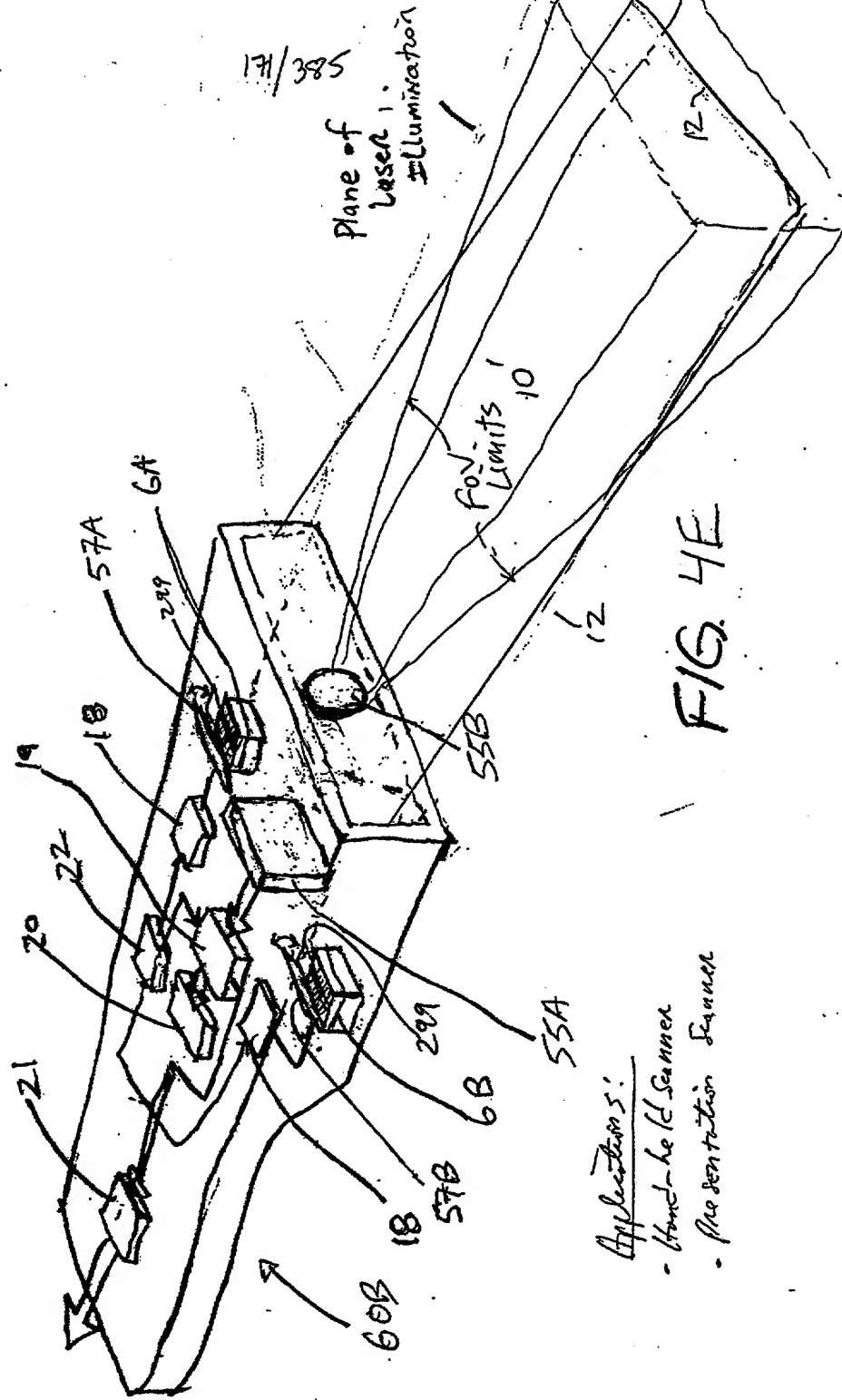


FIG. 4D





- Applications:
- Hand-held Scanner
  - Presentation Scanner

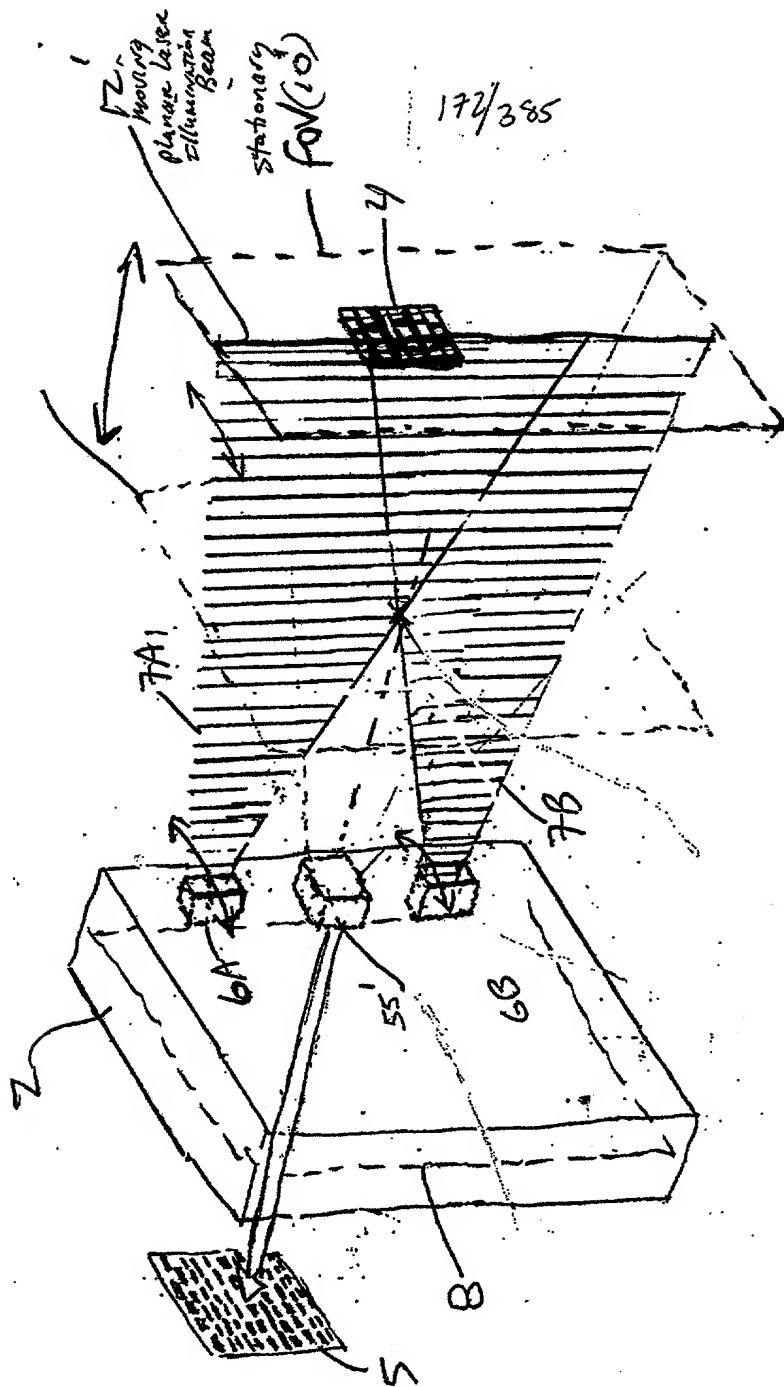


FIG. 5A

70 →

202020 29489001

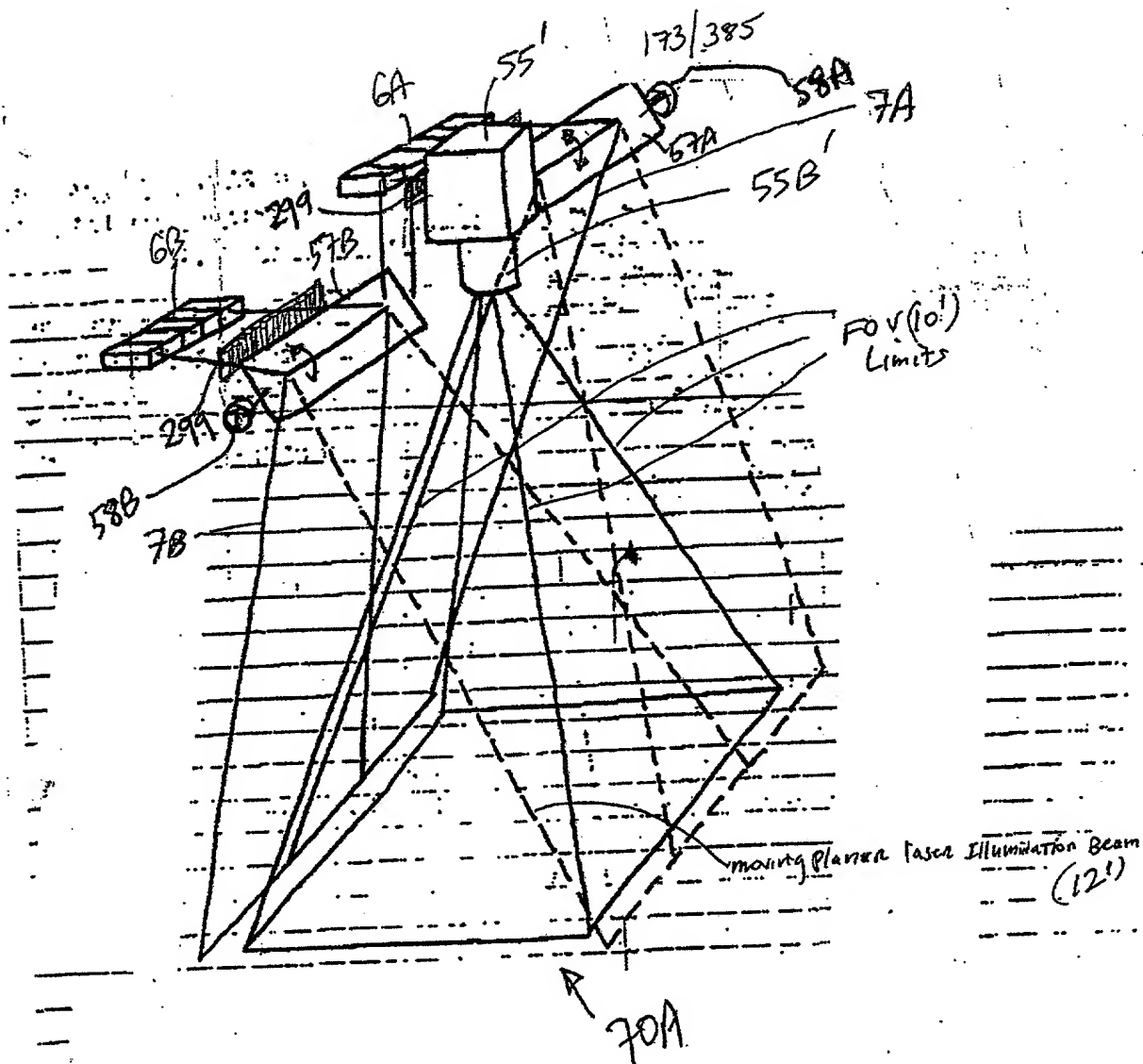


FIG 5B1

174/385

optical axis  
(FOV) 10°

6A 57A 299 55B 55A 6B 299 57B 70A

(1) Fixed focal length camera lens  
(2) variable focal distance

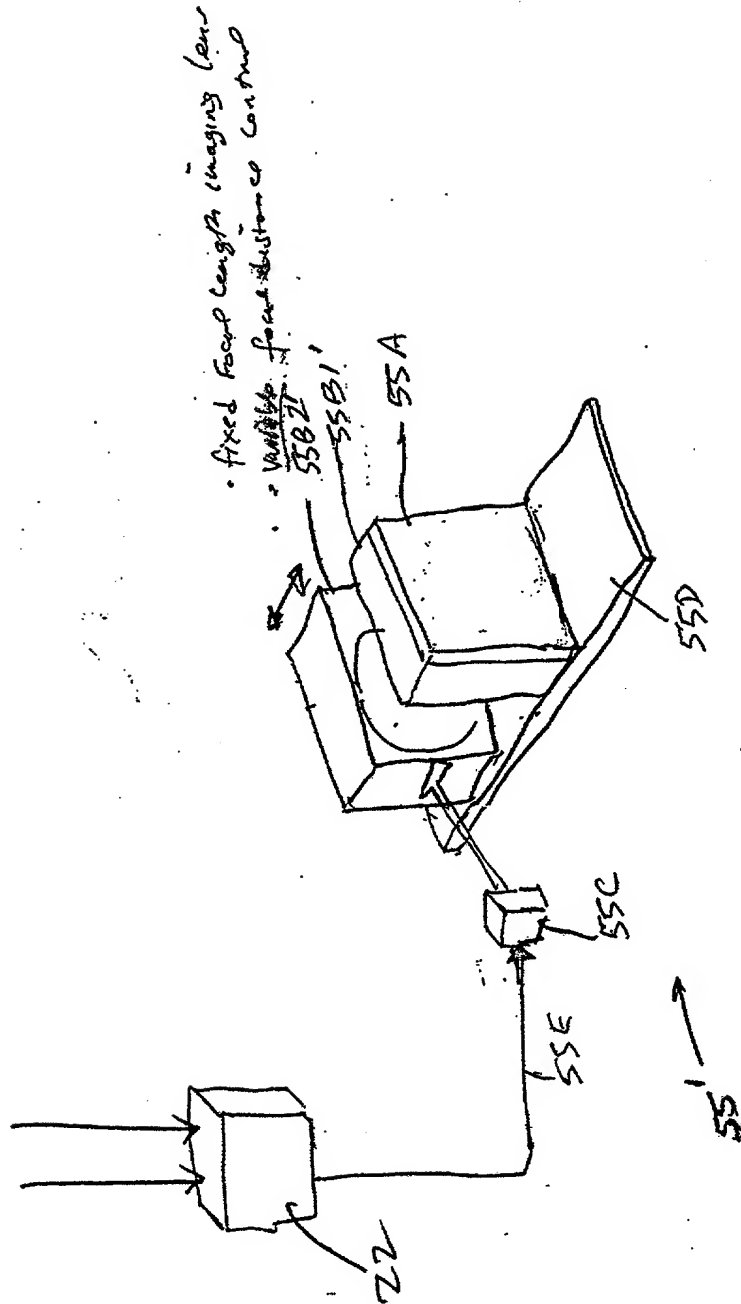
FIG. 5B2

175/385



Fig. 53

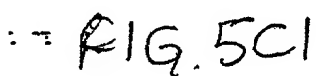
176/385



fixed focal length imaging lens  
variable focal distance control

FIG. 5B4

177/385



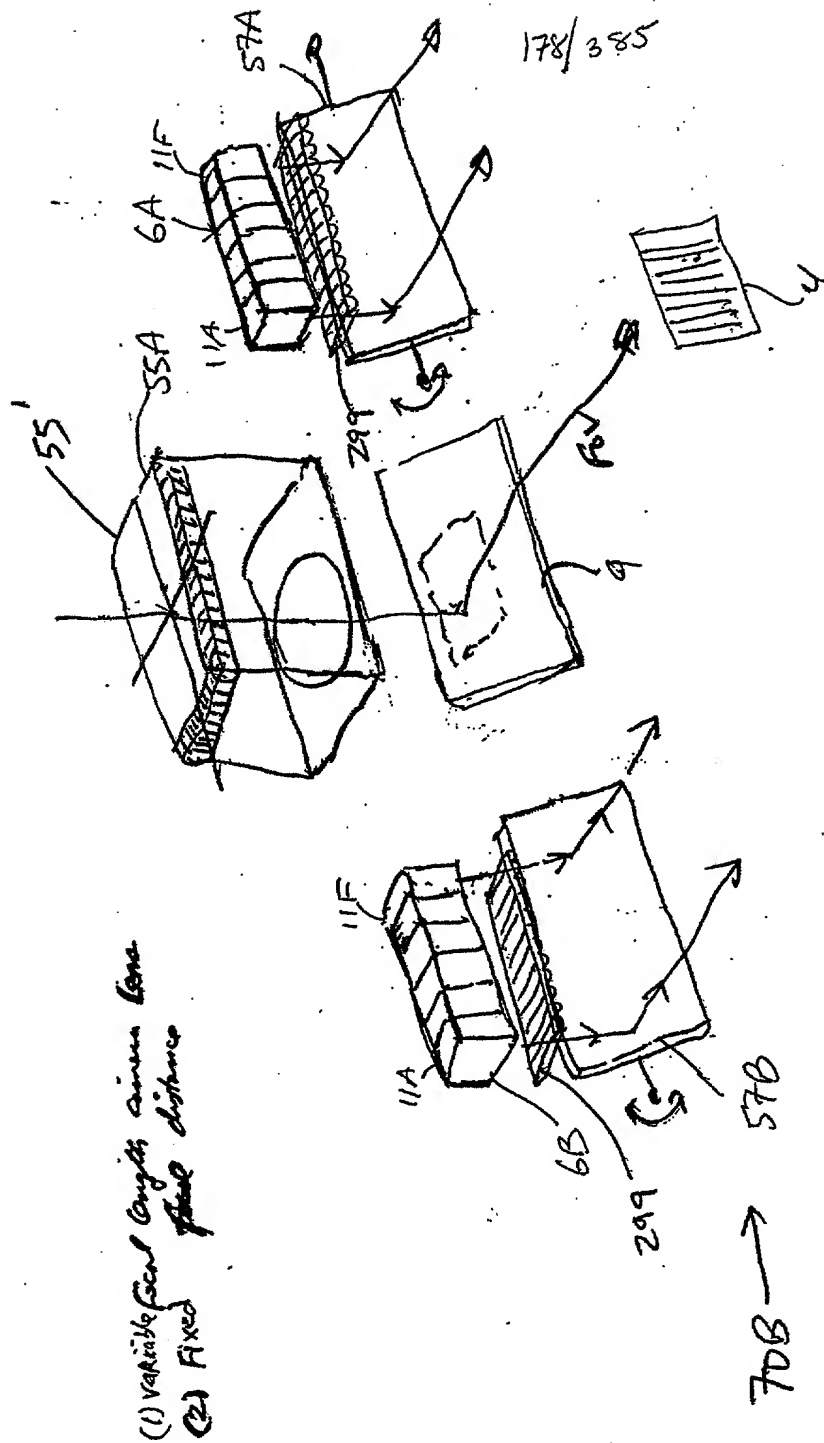


FIG. 5C



[illegible]

Fig. 5C3

180/385

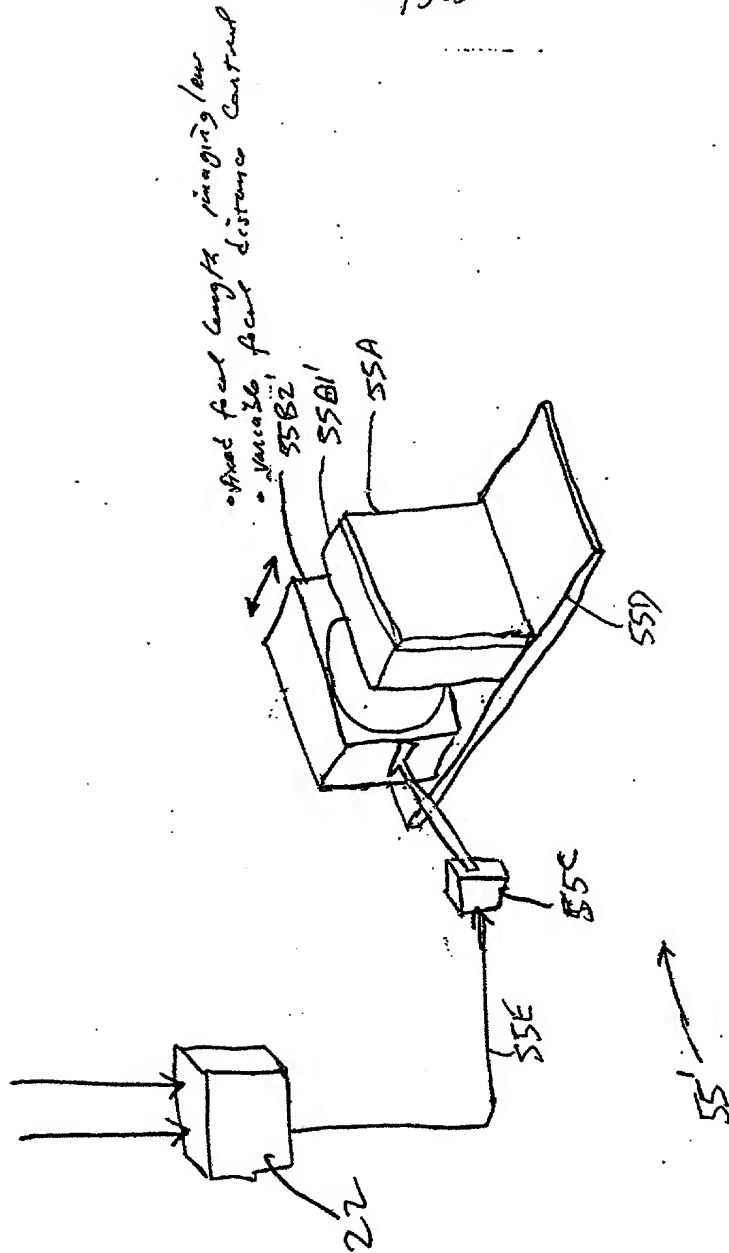


FIG. 5C4

181/385

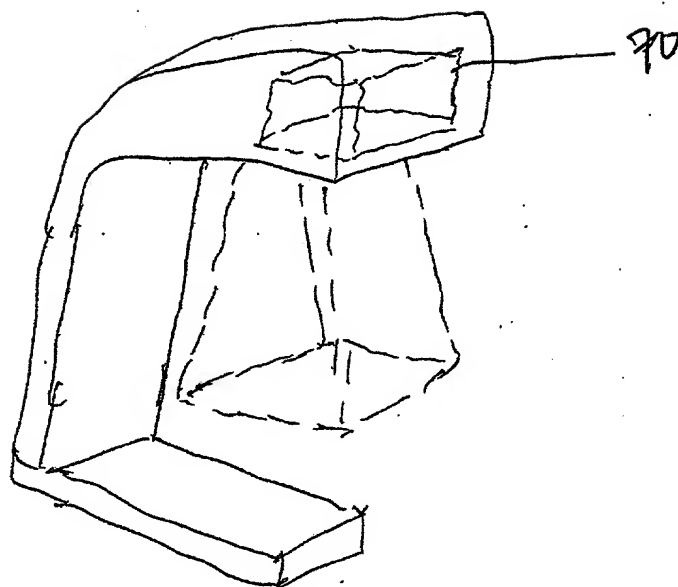


FIG. 5D

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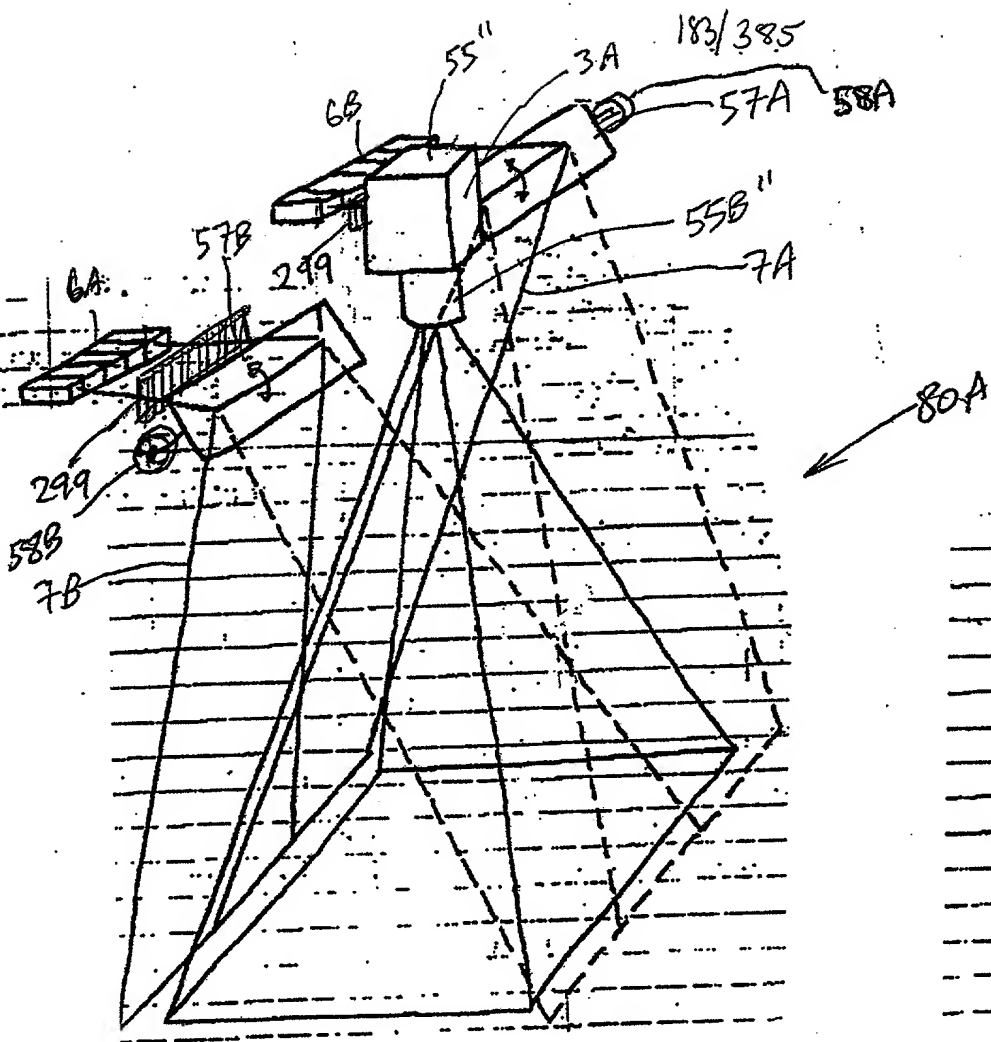
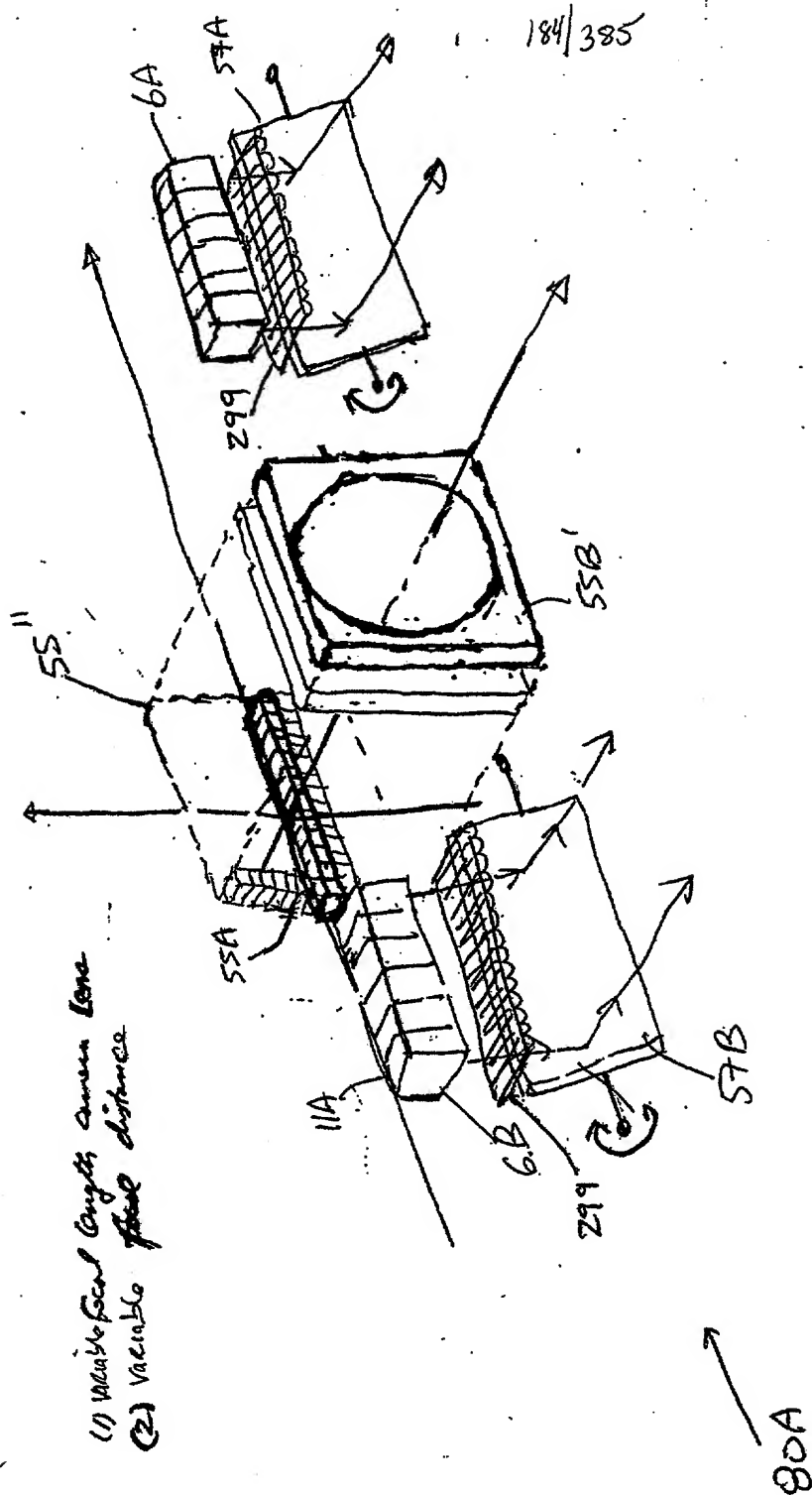
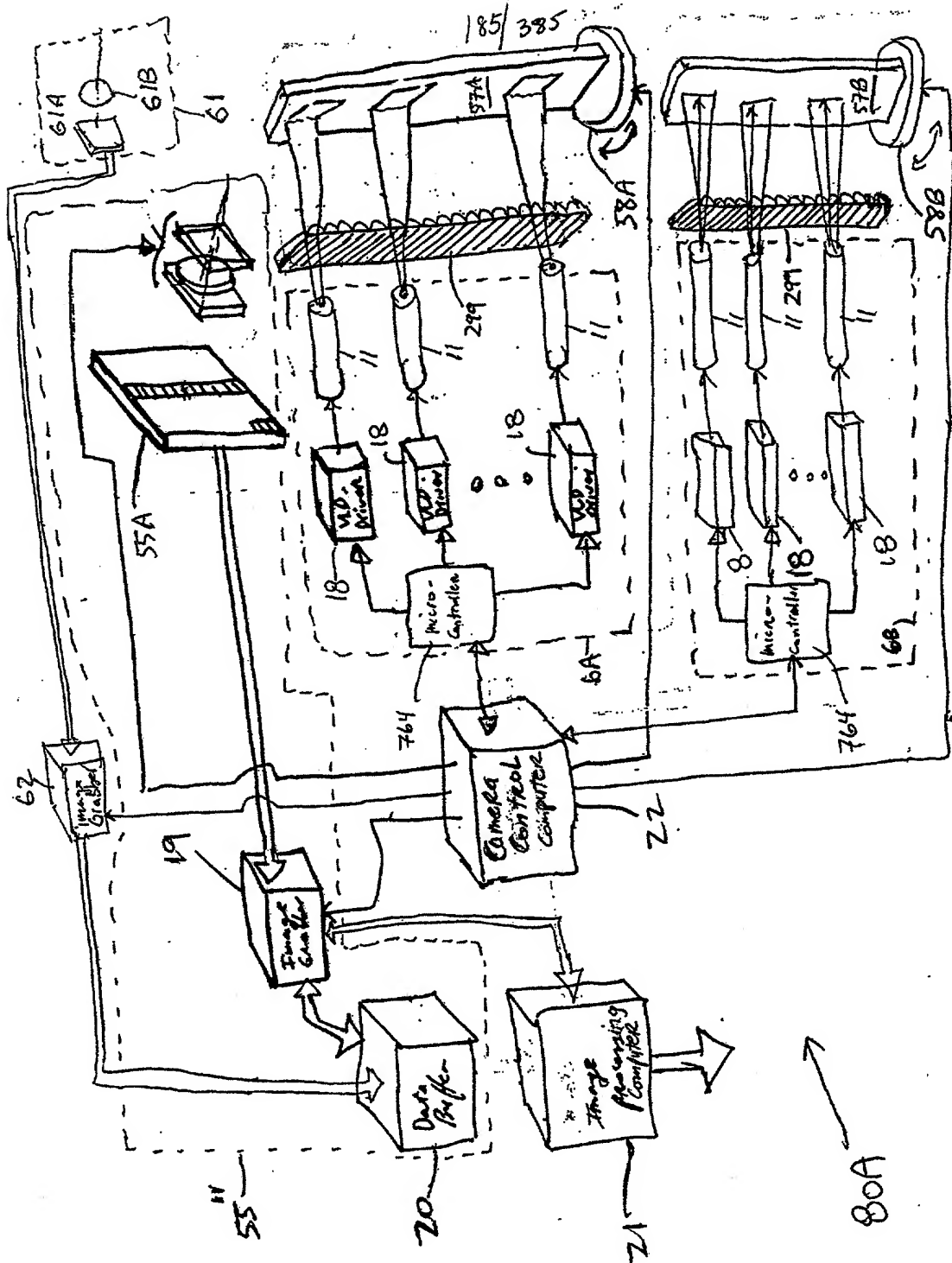


FIG. 6B1





186/385

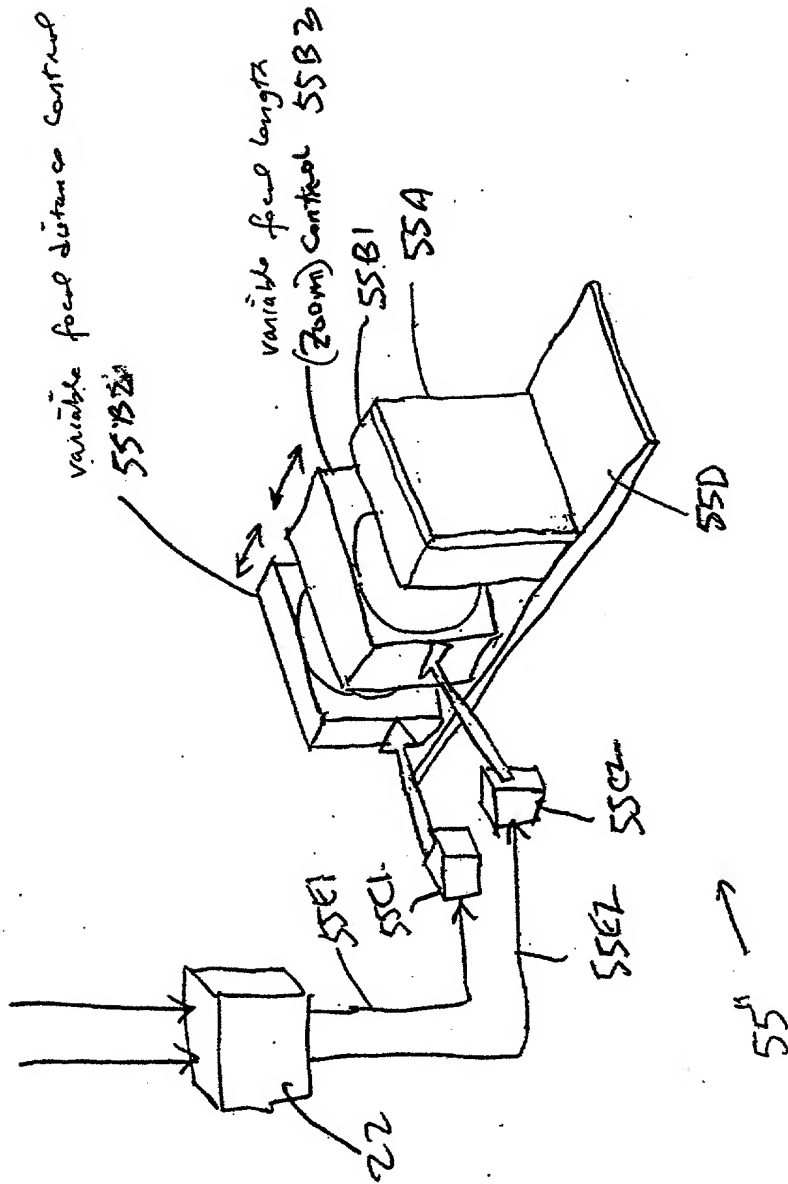


FIG. 6B4



202020 29489001

187/385

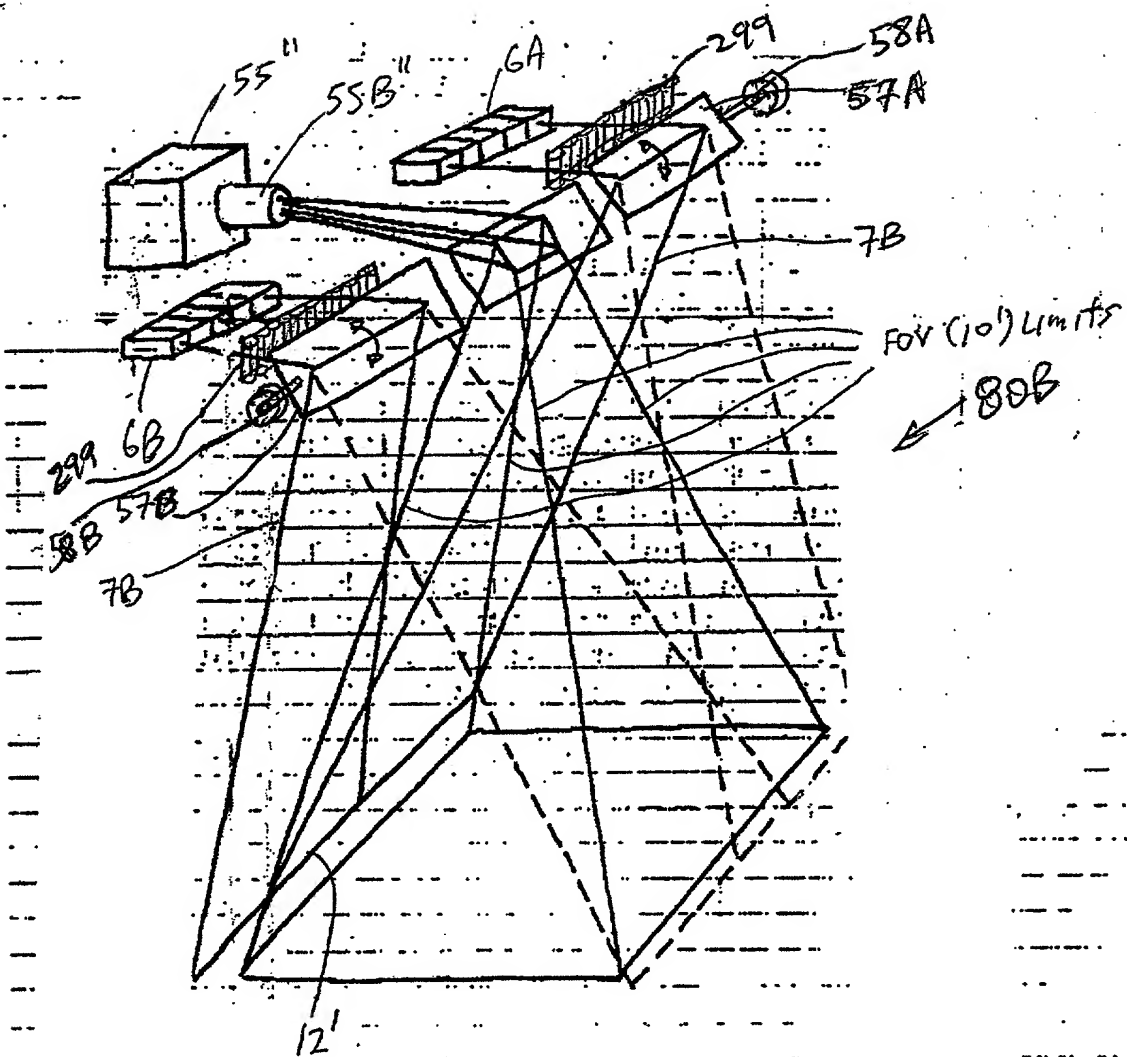


FIG. 6C1

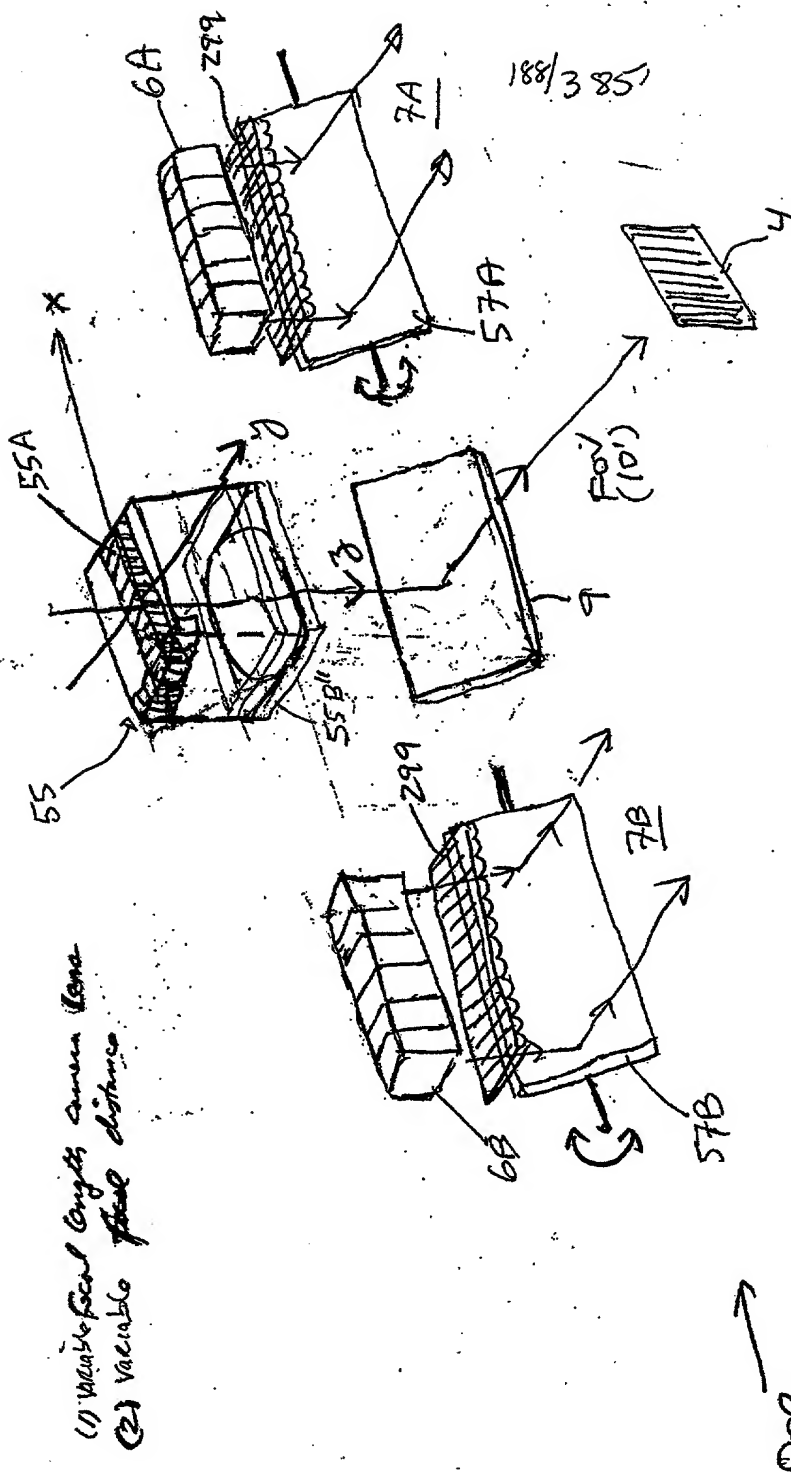


FIG. 6C2



10058462.020702

190/385

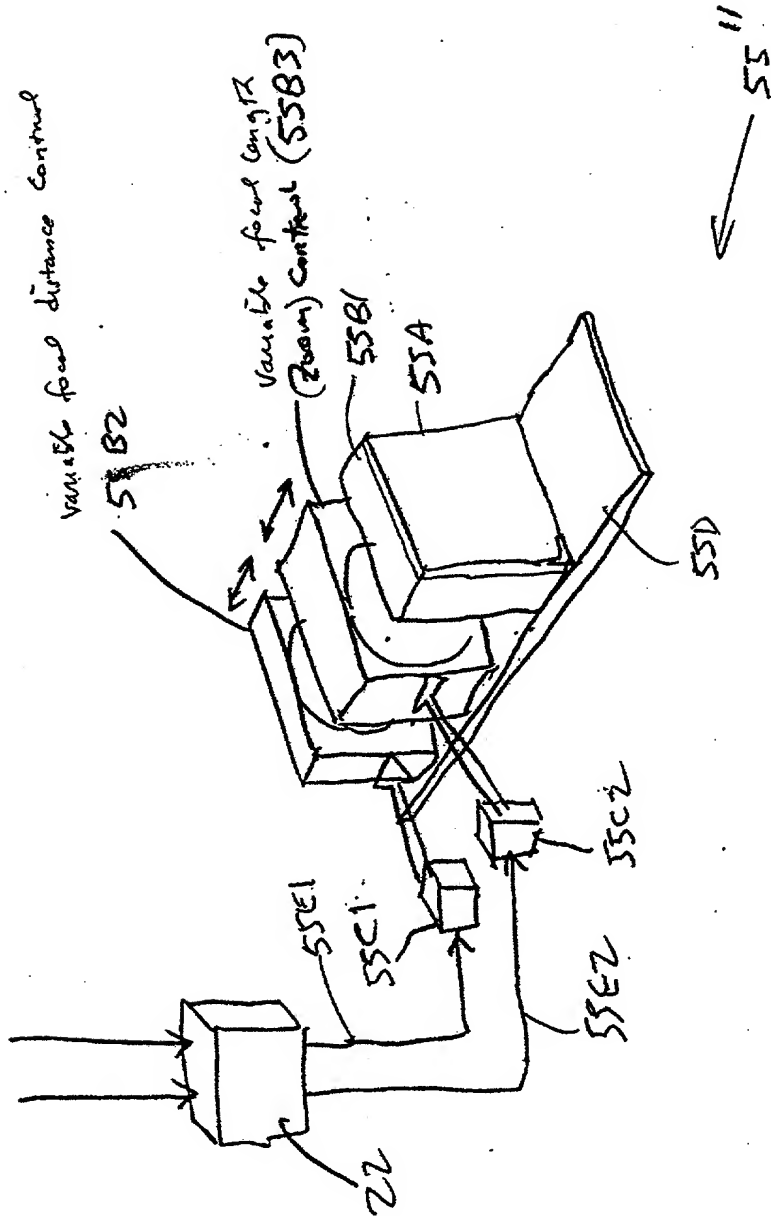


FIG. 6C4

191/385

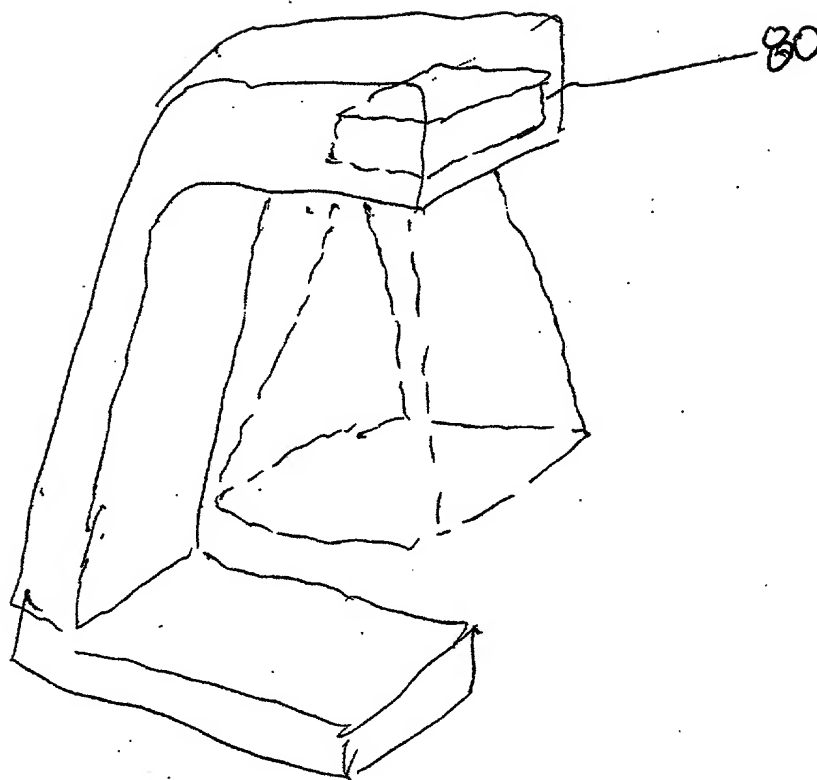


FIG. 6C5

10058462.020302

1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2792 2793 2794 2795

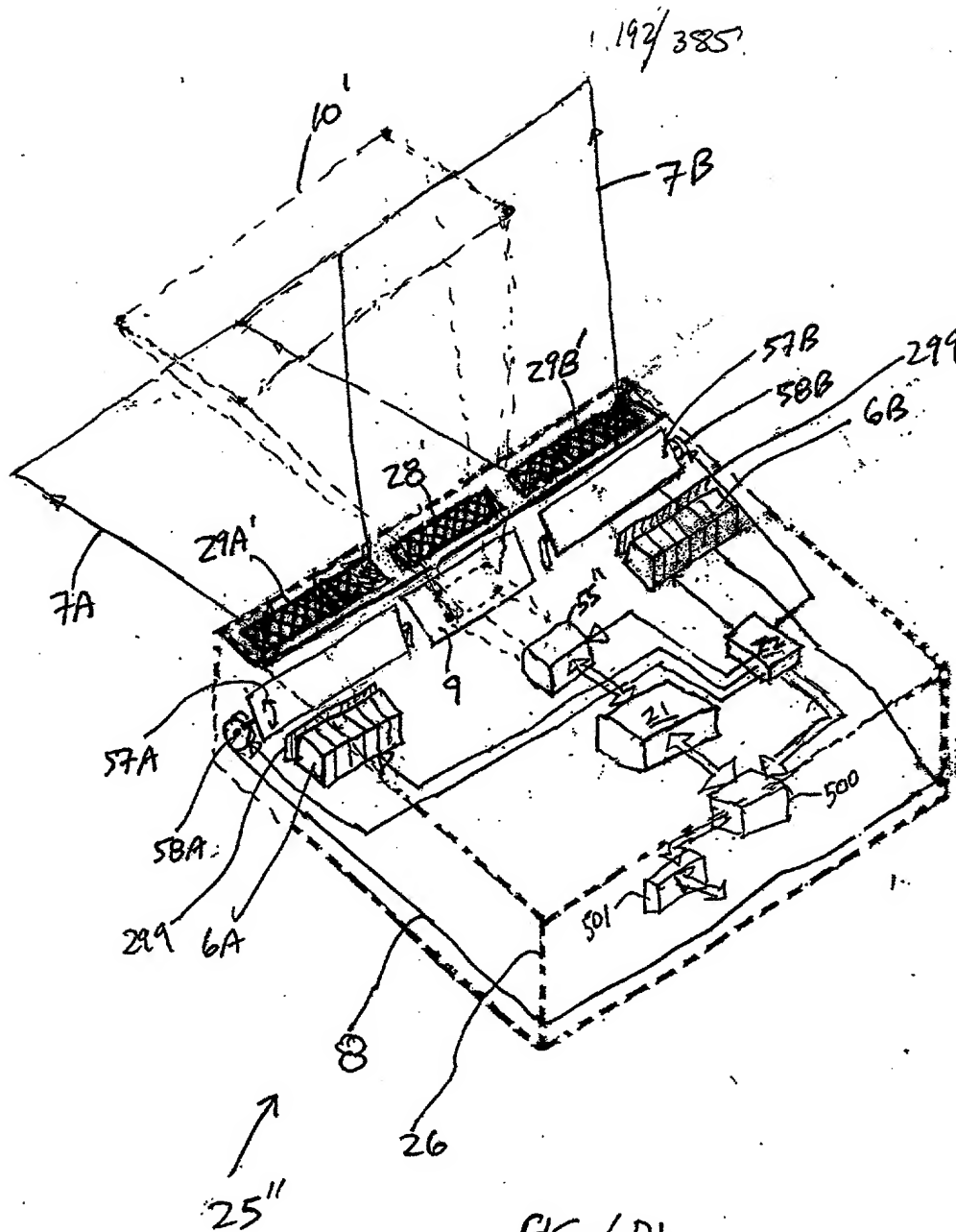


FIG. 6D1

1065462.020702

193/385

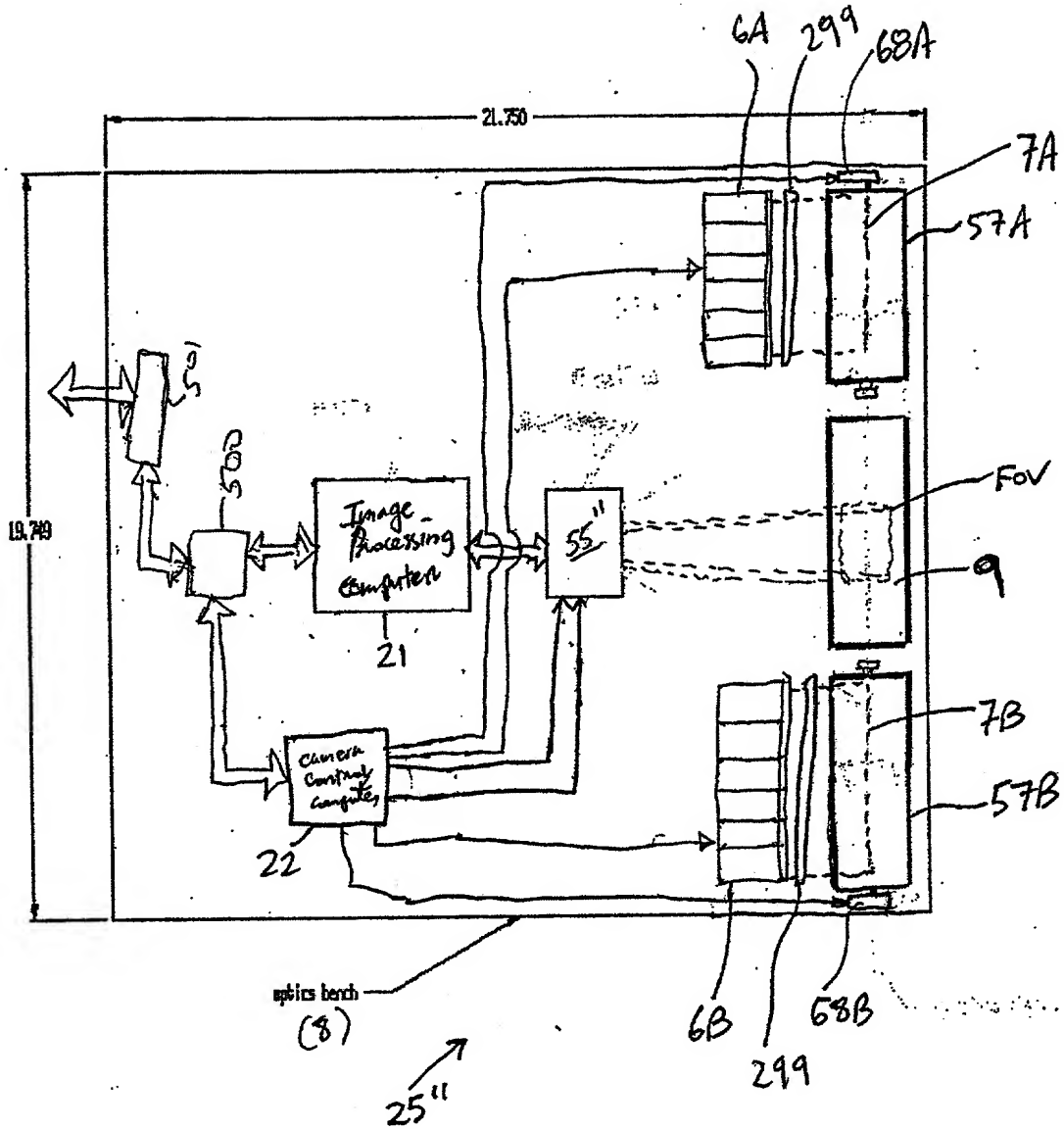
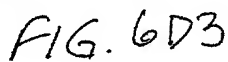


FIG. 6D2

**TOTALS**





195/385

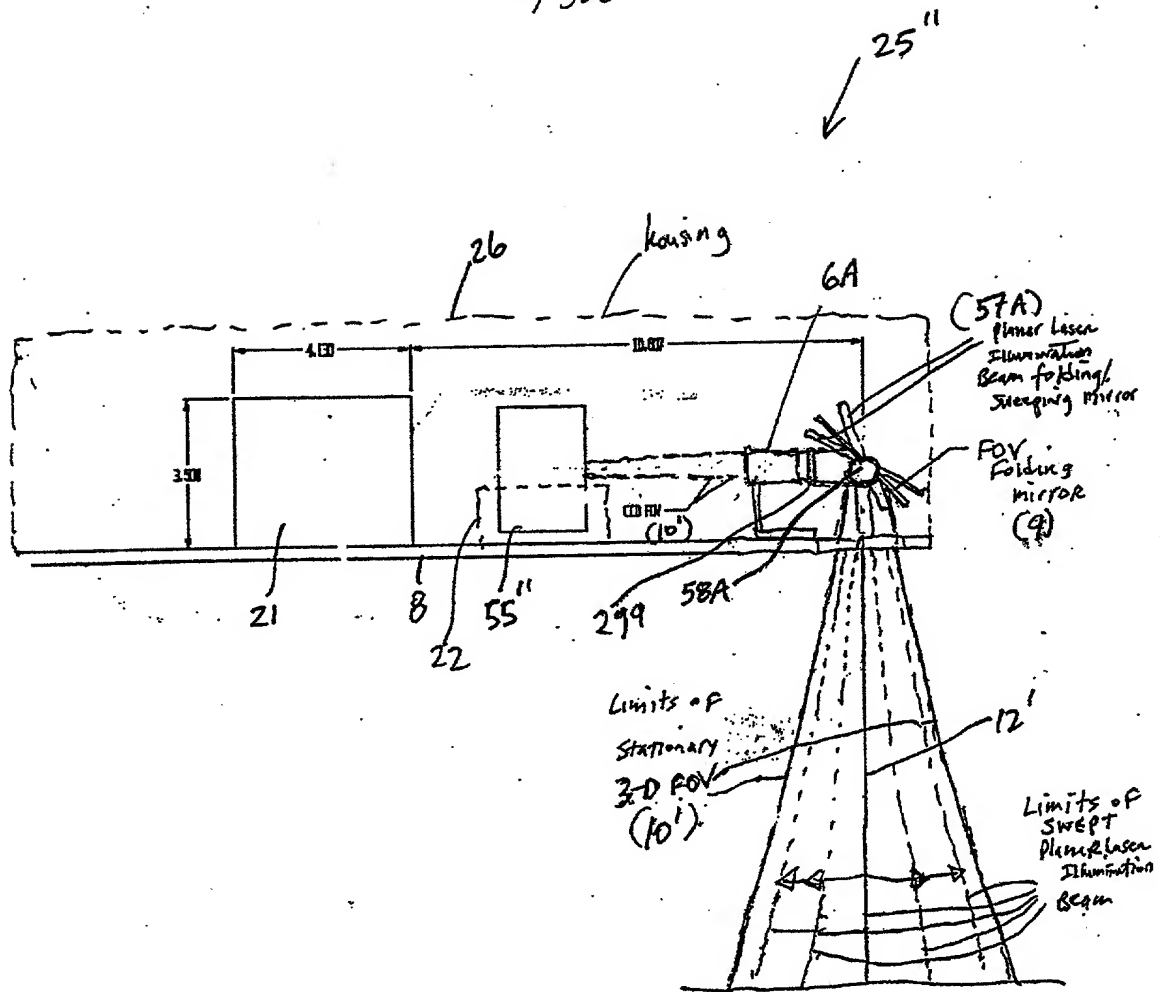


FIG. 6D4

202020 294800T

196/385

Variable FOV

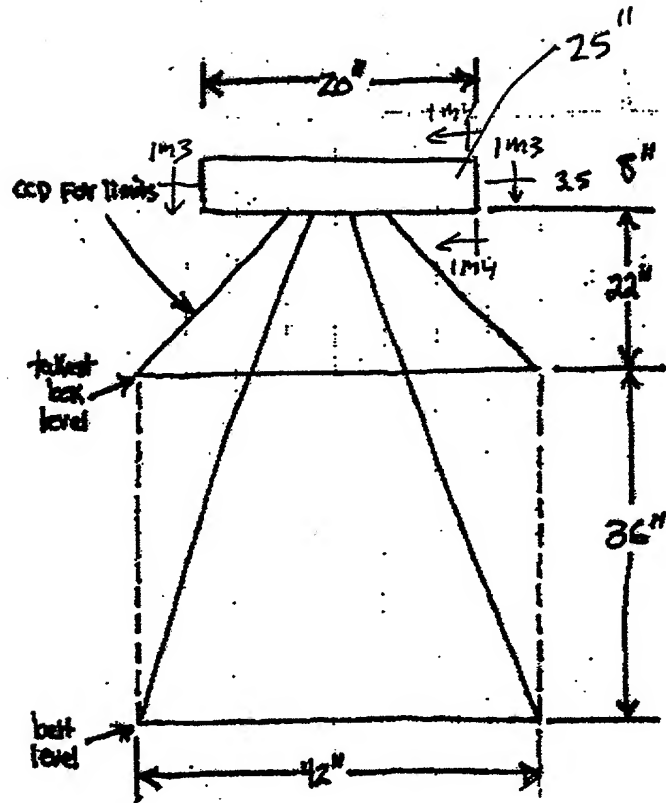


FIG. 6D5

1065462-020702

10063462.020702

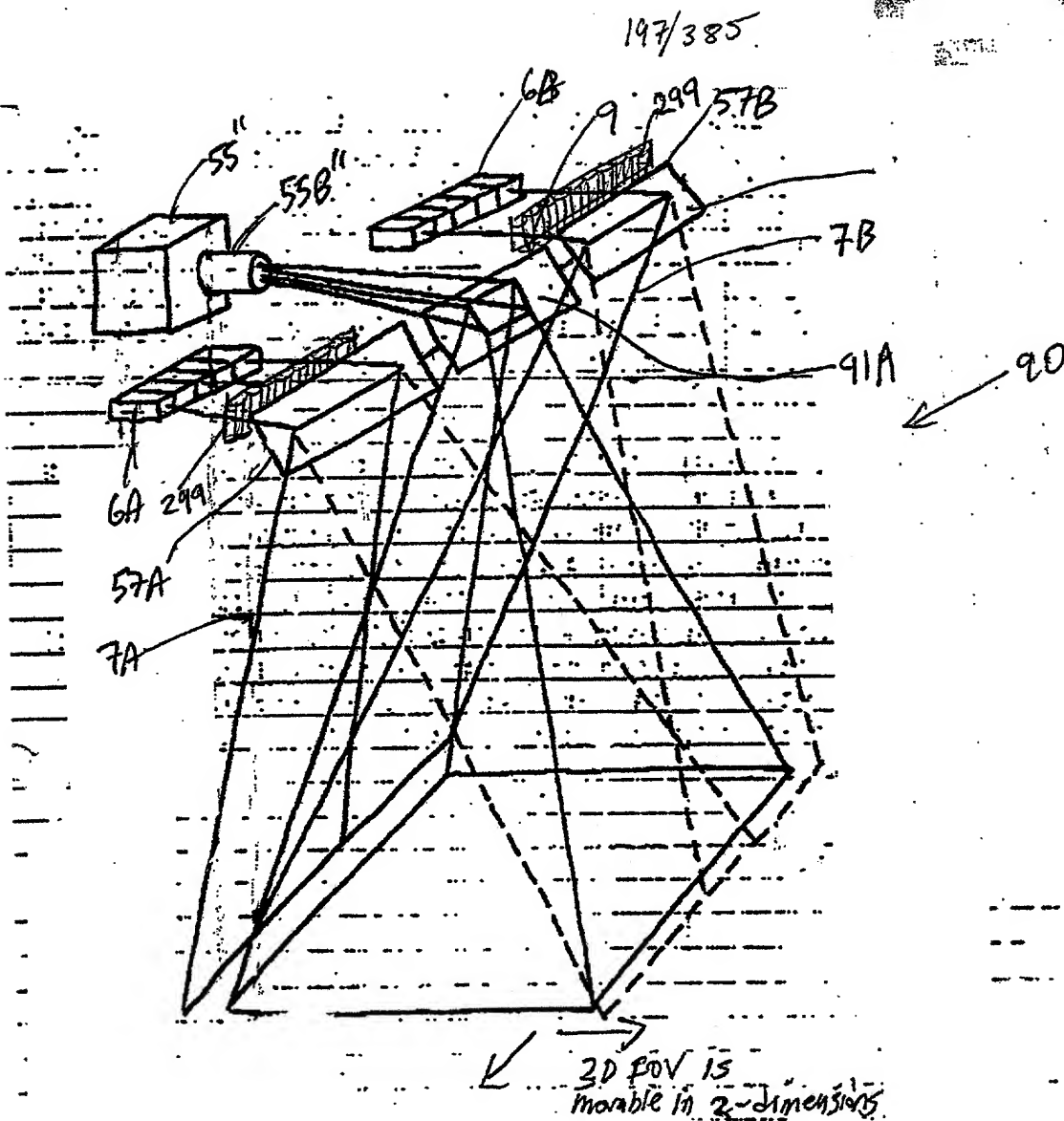


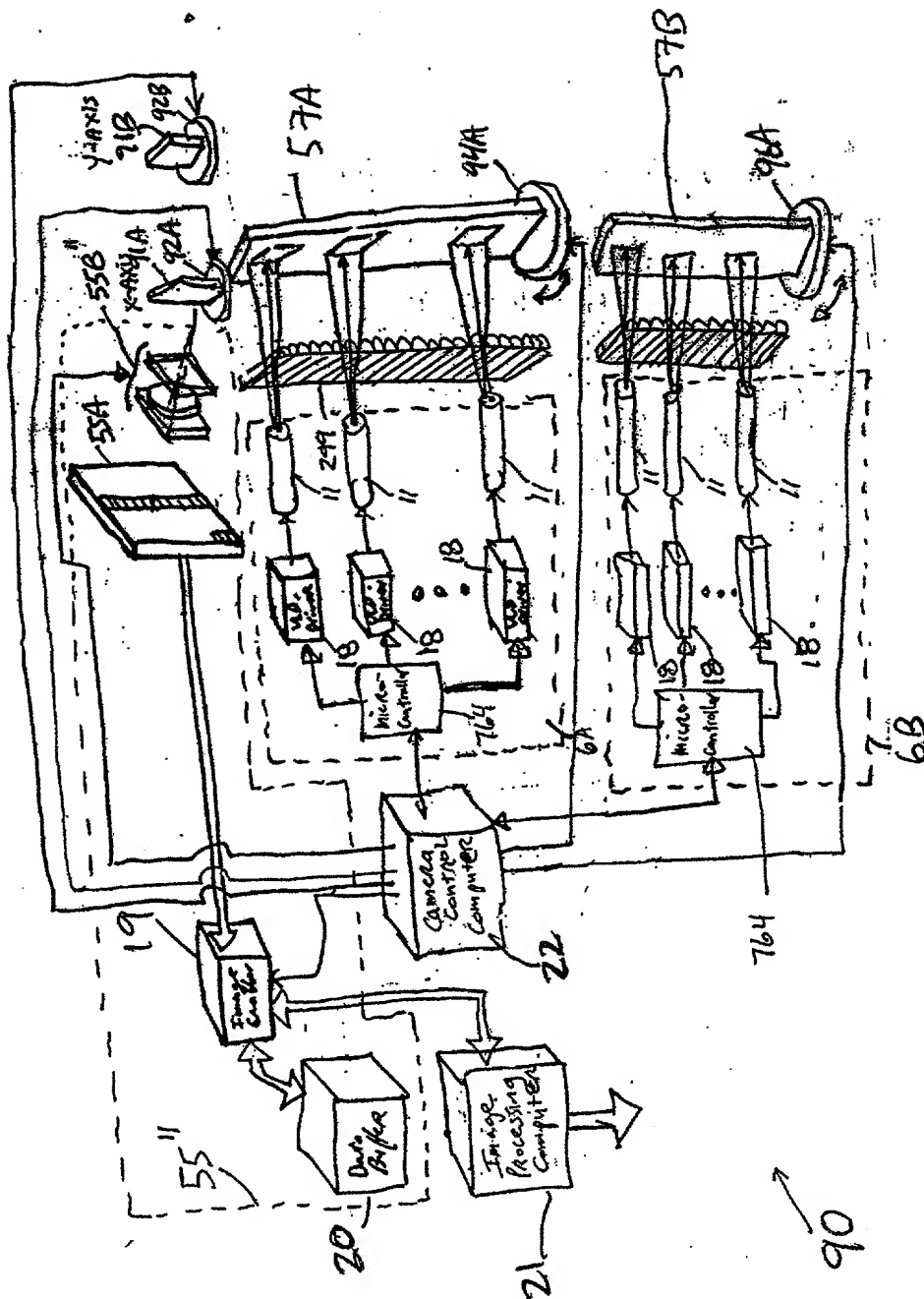
FIG 6E1

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90



FIG. 6f-2



200/385

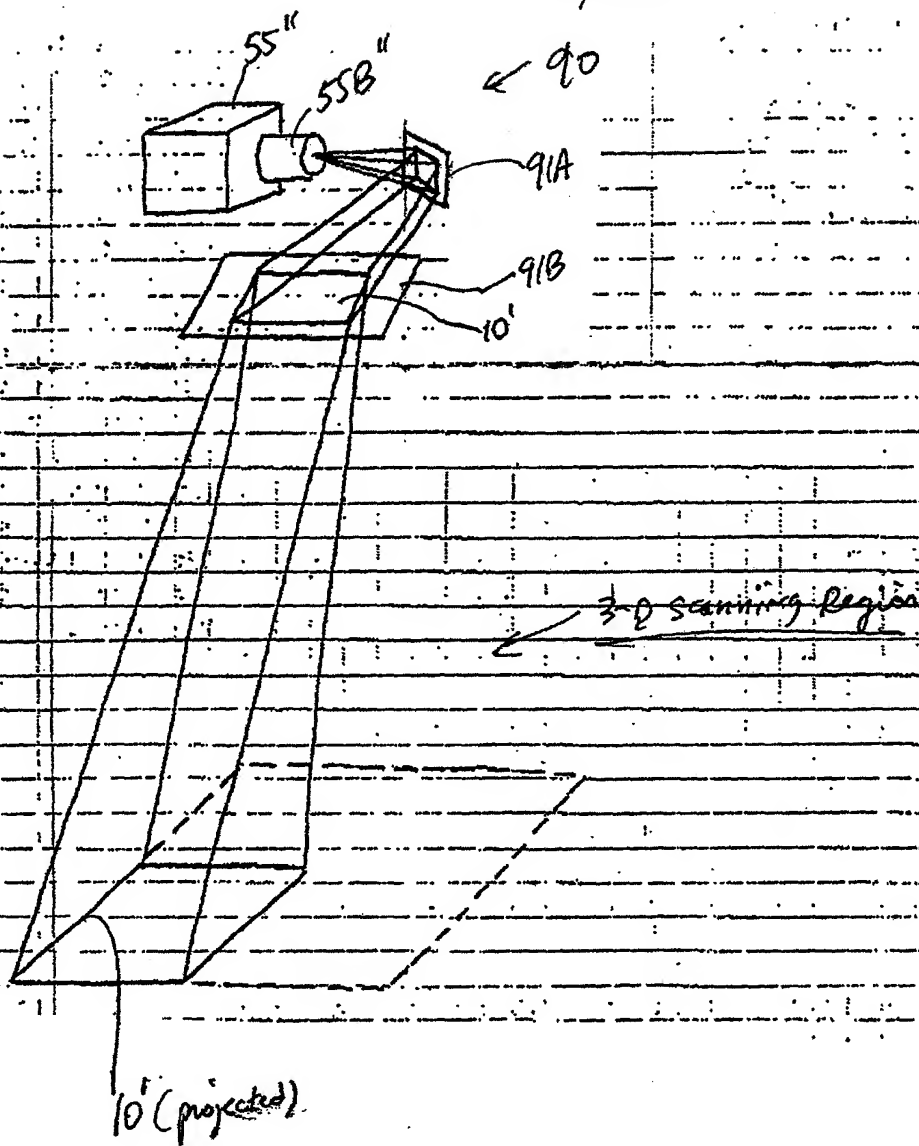
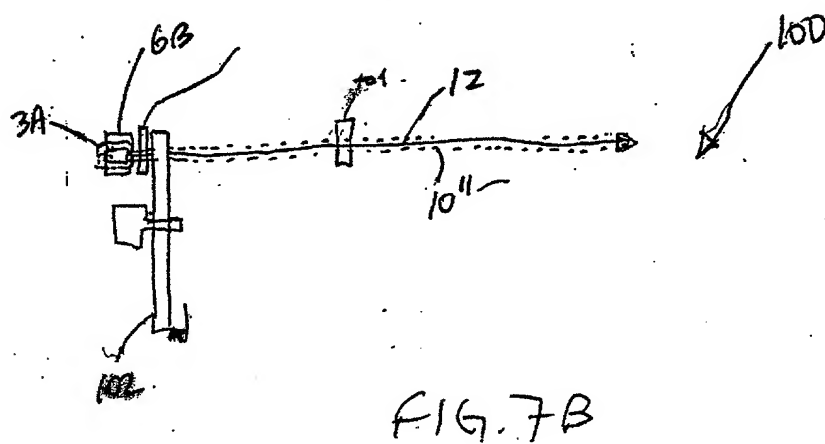
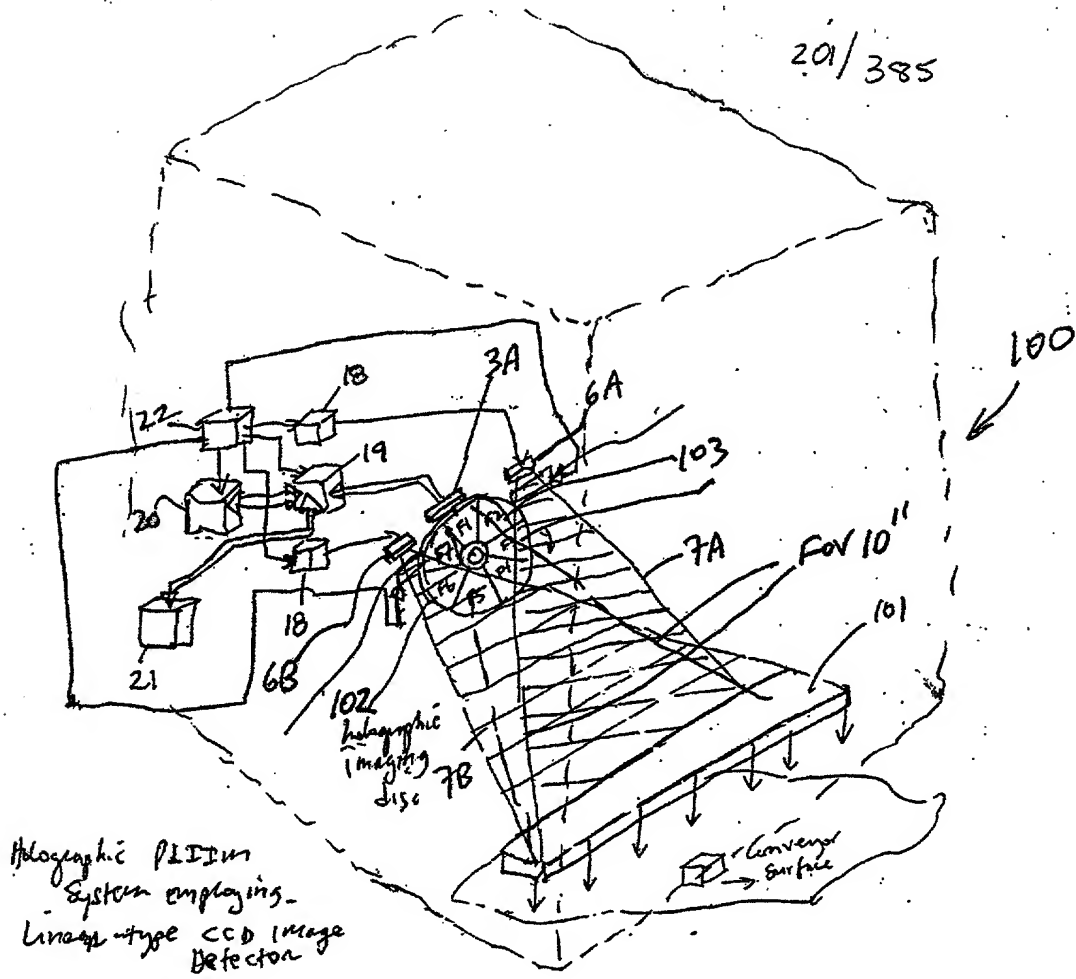


FIG. 6E4

10069462 020702

1006462-020702



202/385

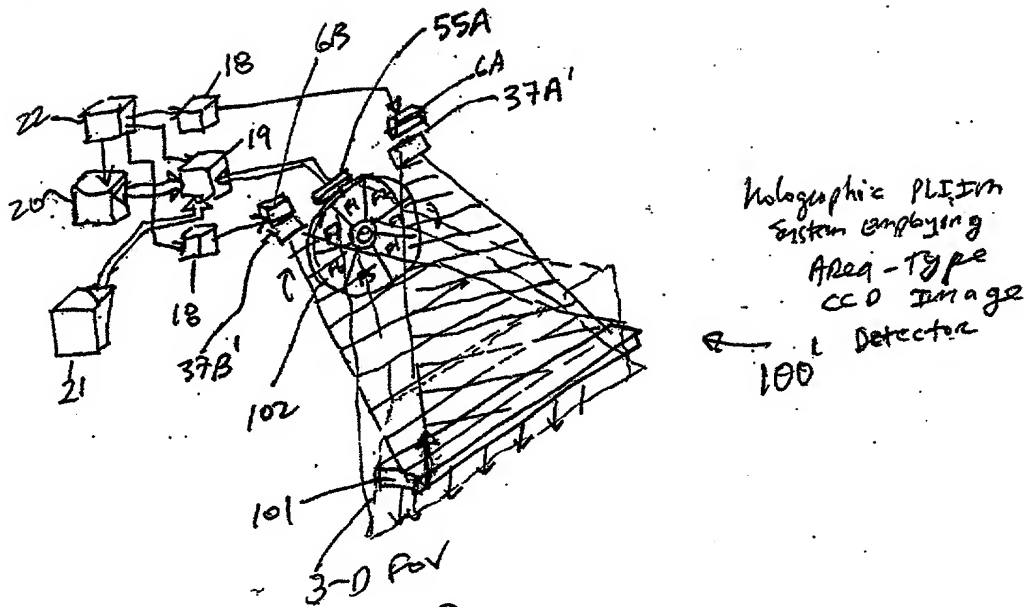


FIG. 8A

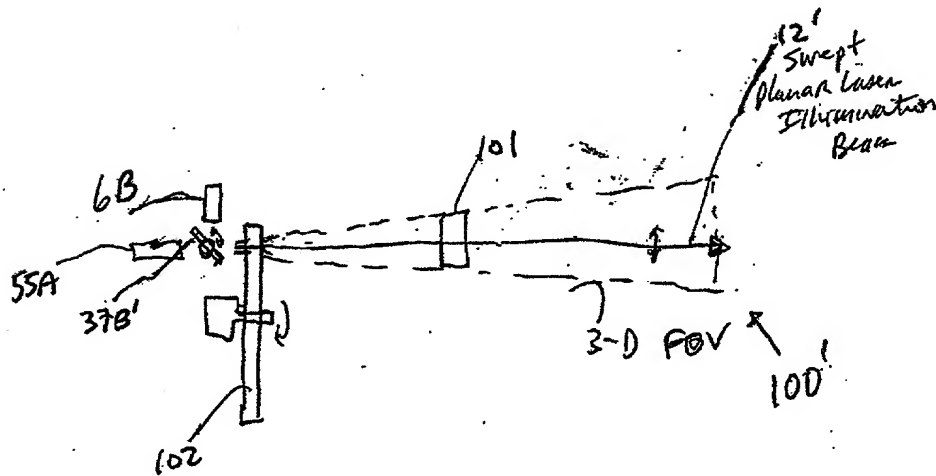


FIG. 8B

202/385



1-D CCD SCANNER EMBODIMENT

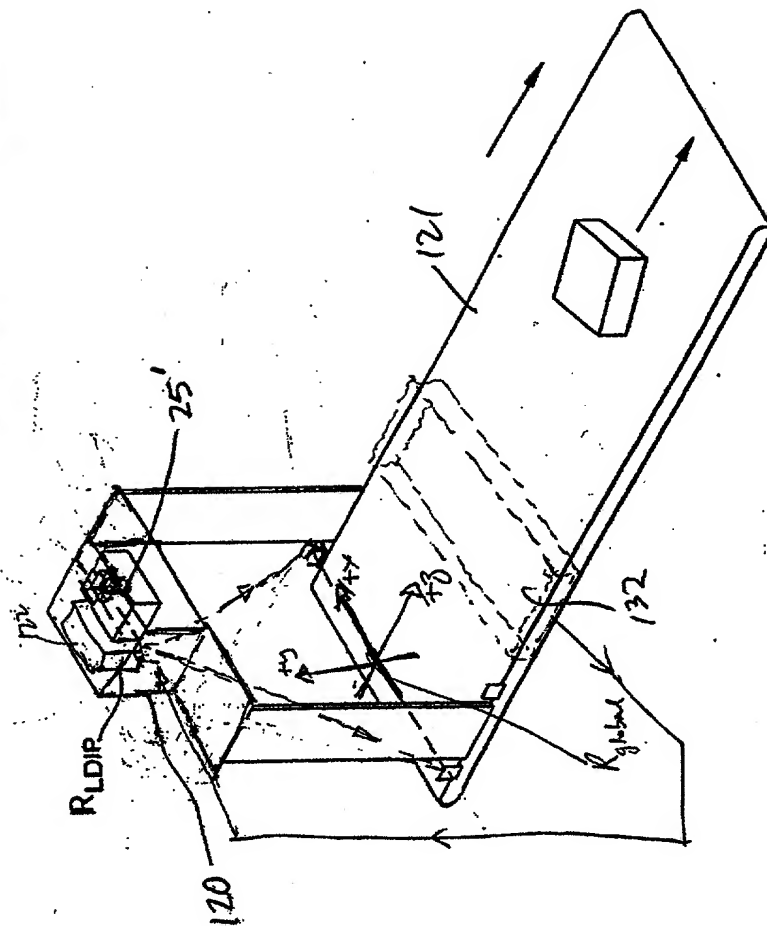
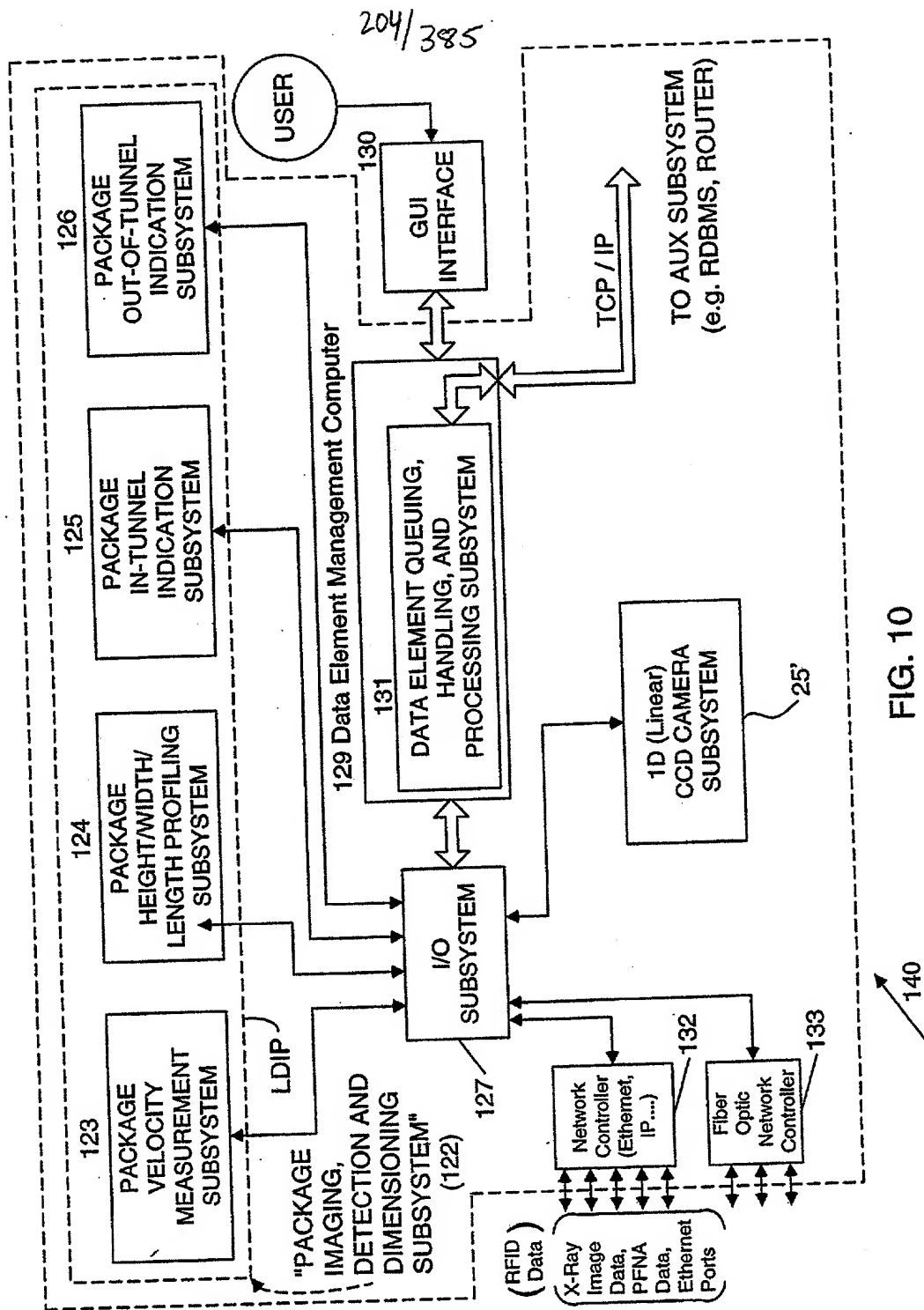


FIG. 9



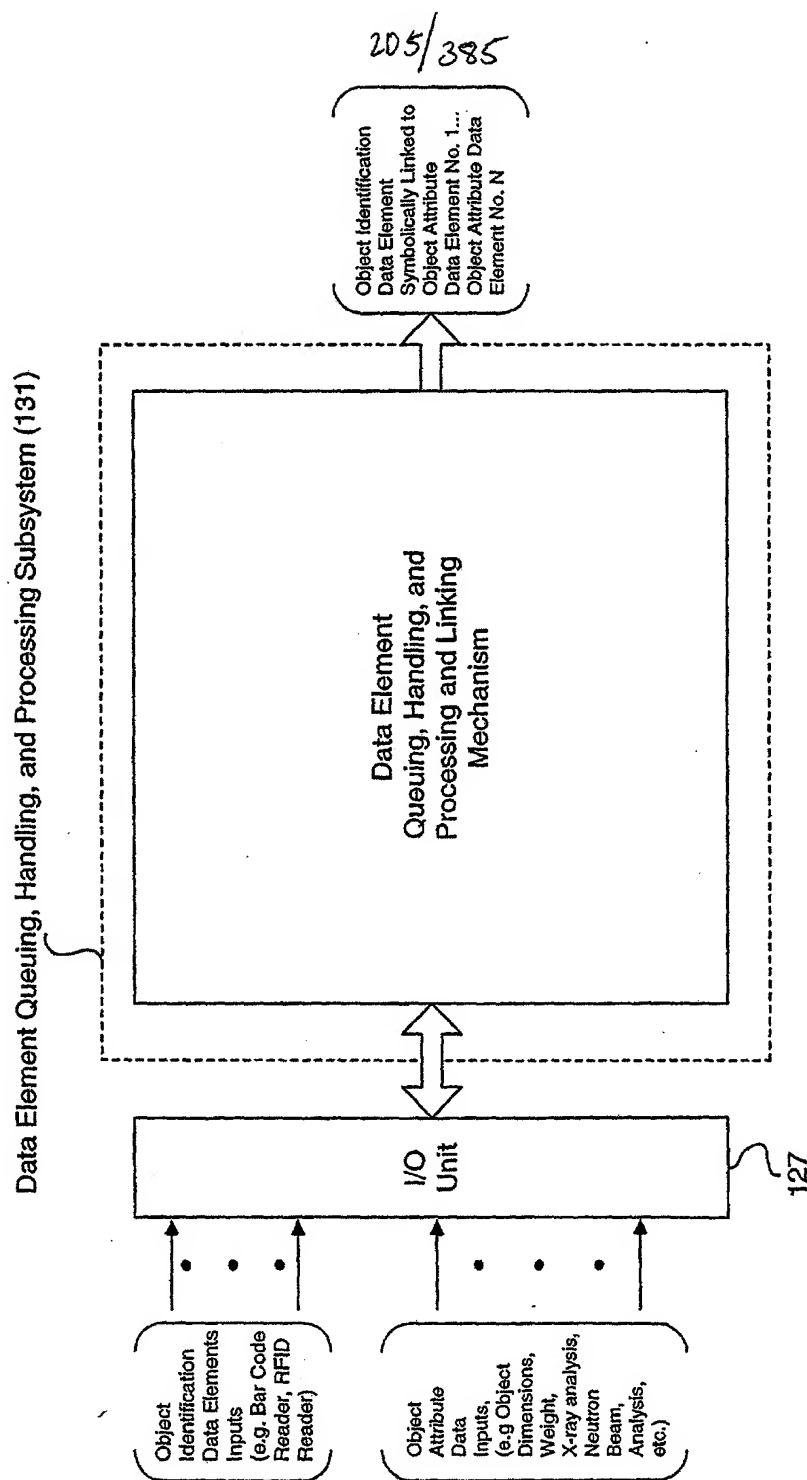


FIG. 10A

206/385

**Primary Network  
and/ or System  
Functions:**

A. Specification of Object  
Detection and  
Tracking Capability of  
System

B. Specification of Object  
Identification  
Capability of System

C. Specification of  
Object Attribute  
Acquisition Capability  
of System

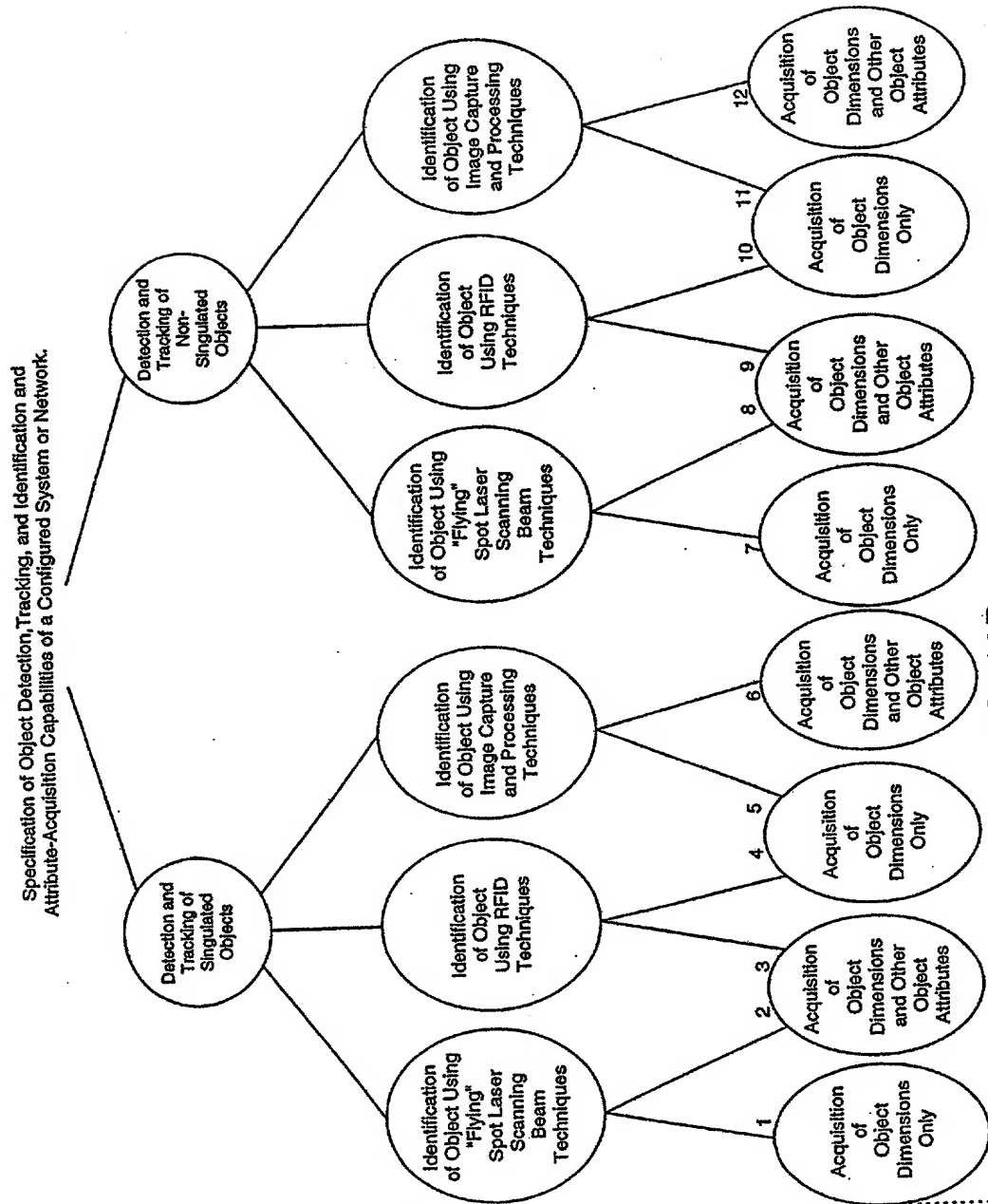


FIG. 10B

207/385

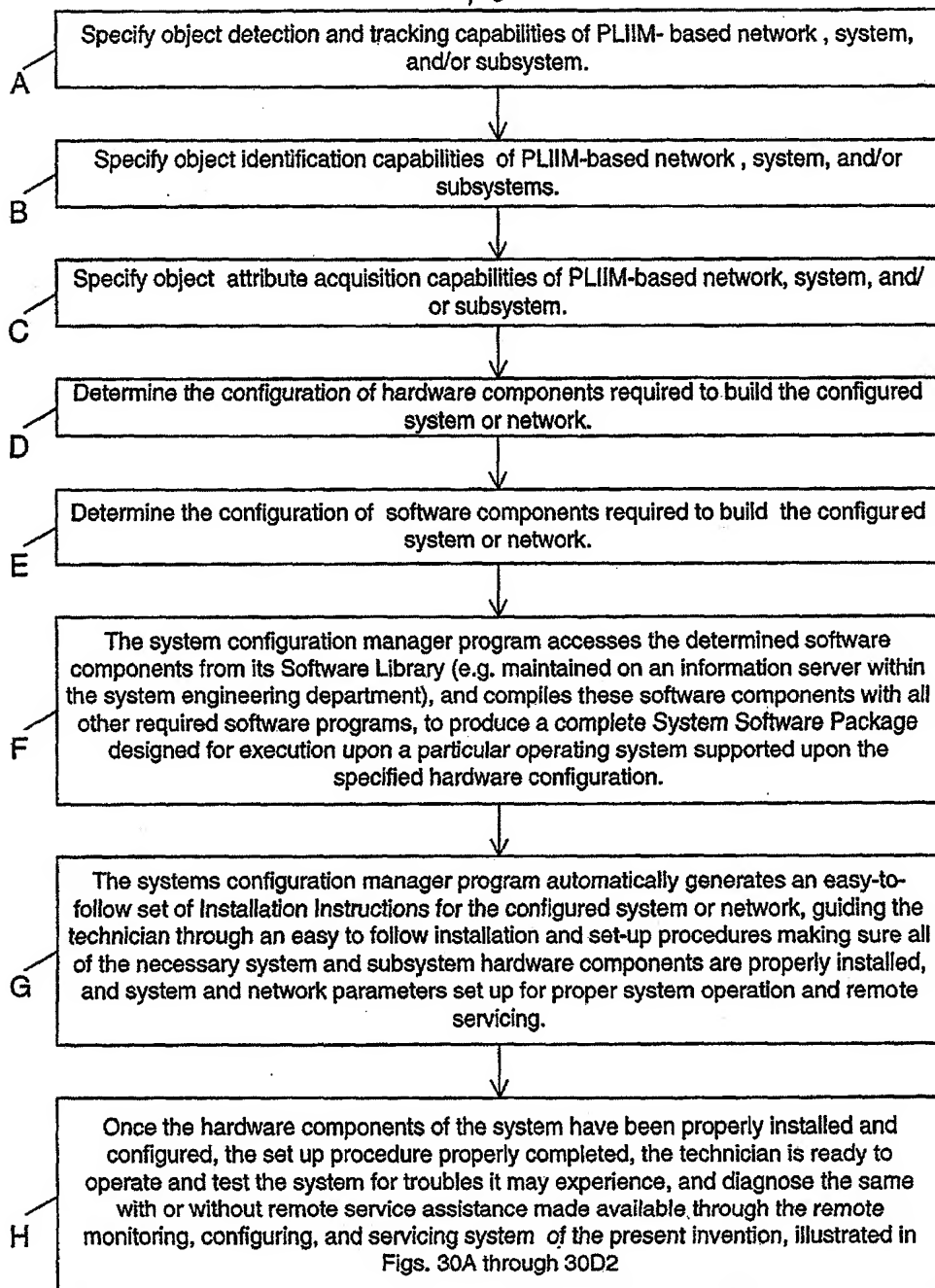


FIG. 10C

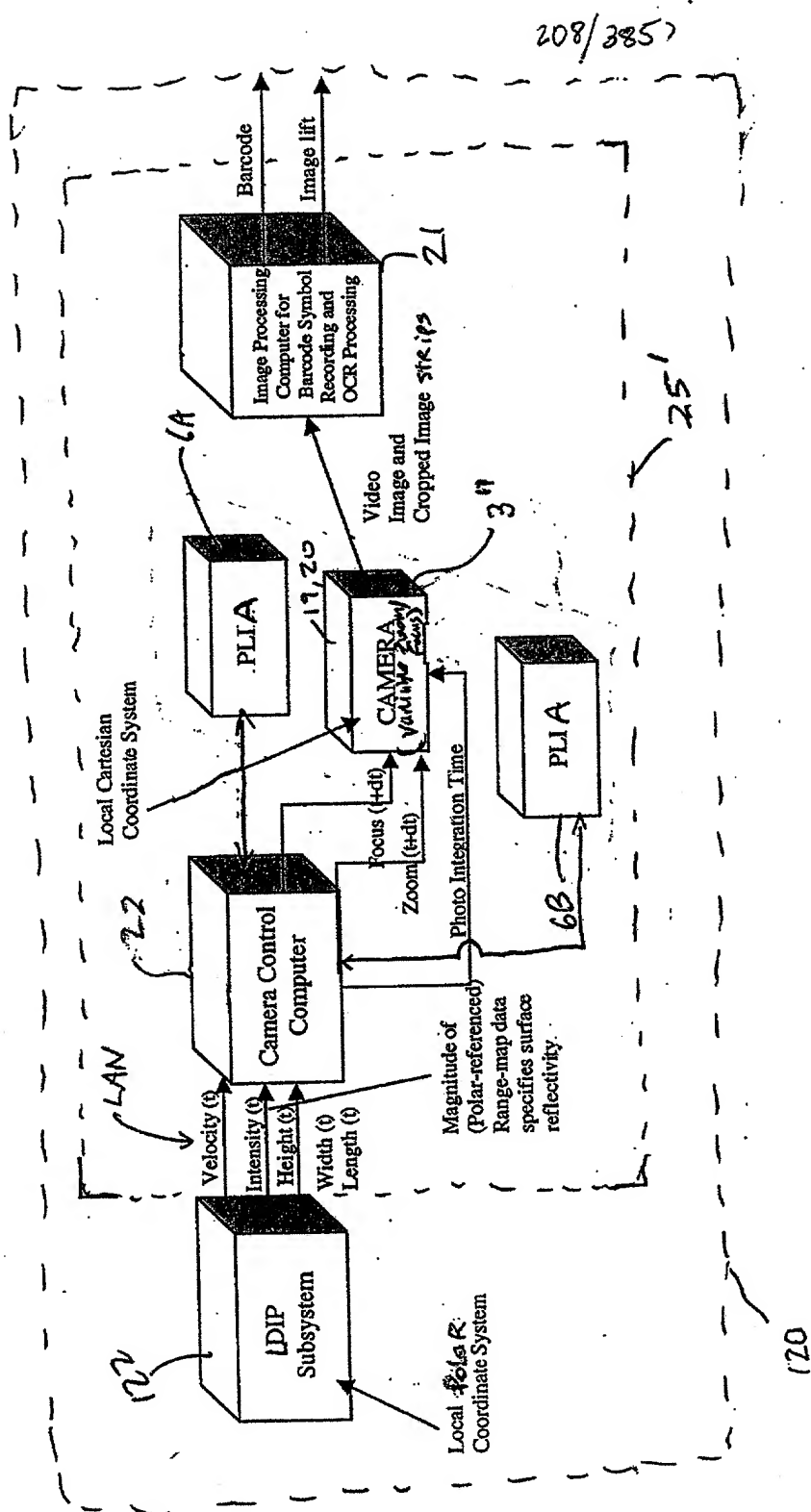


FIG. 11

209/385

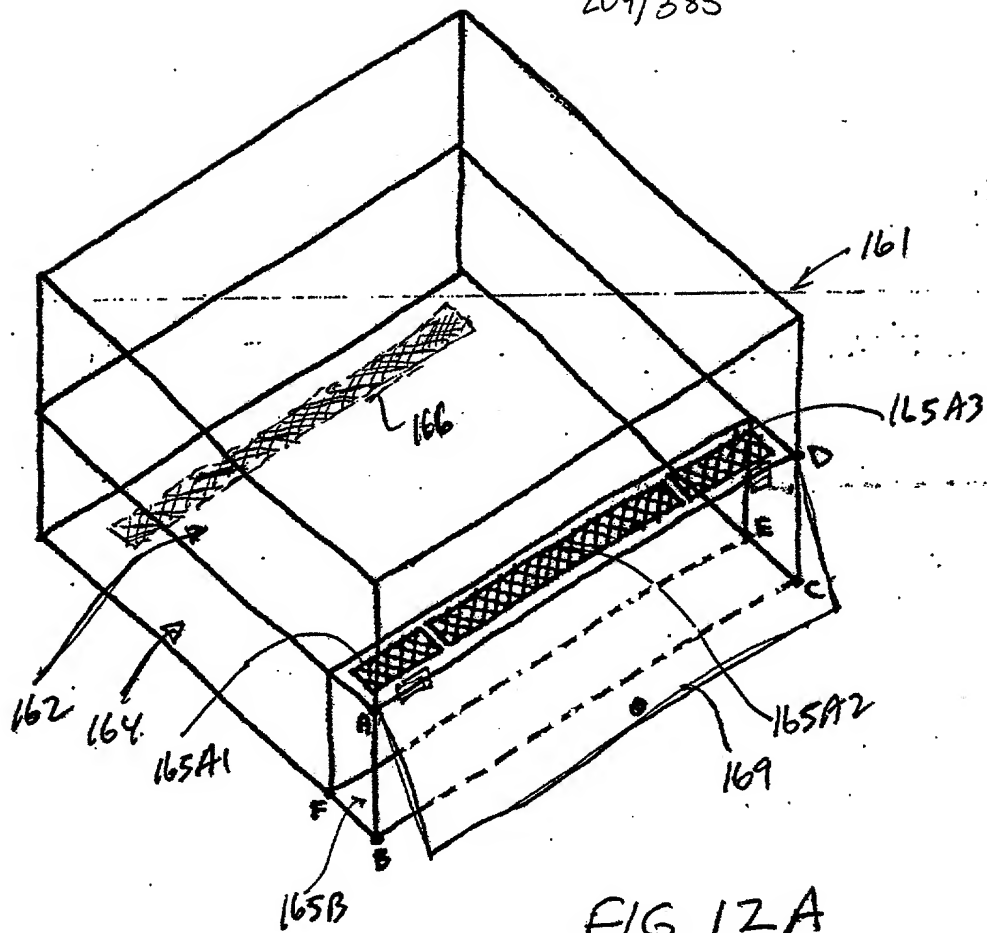


FIG. 12A

210/385

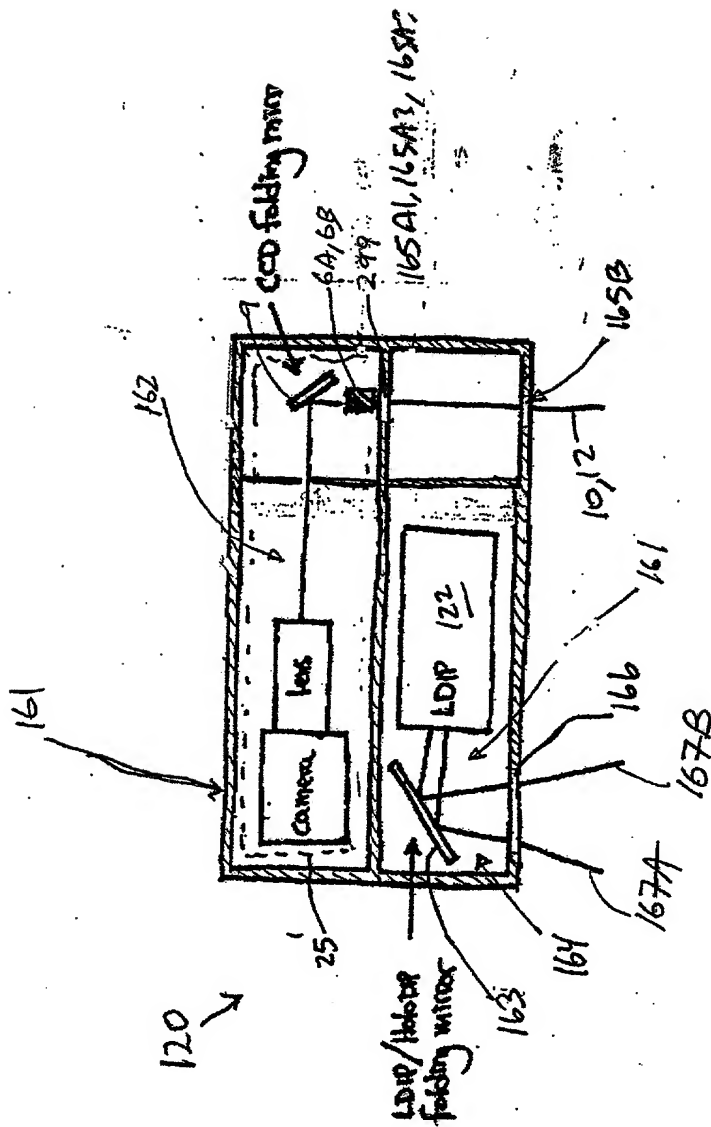


FIG. 12B



211/385

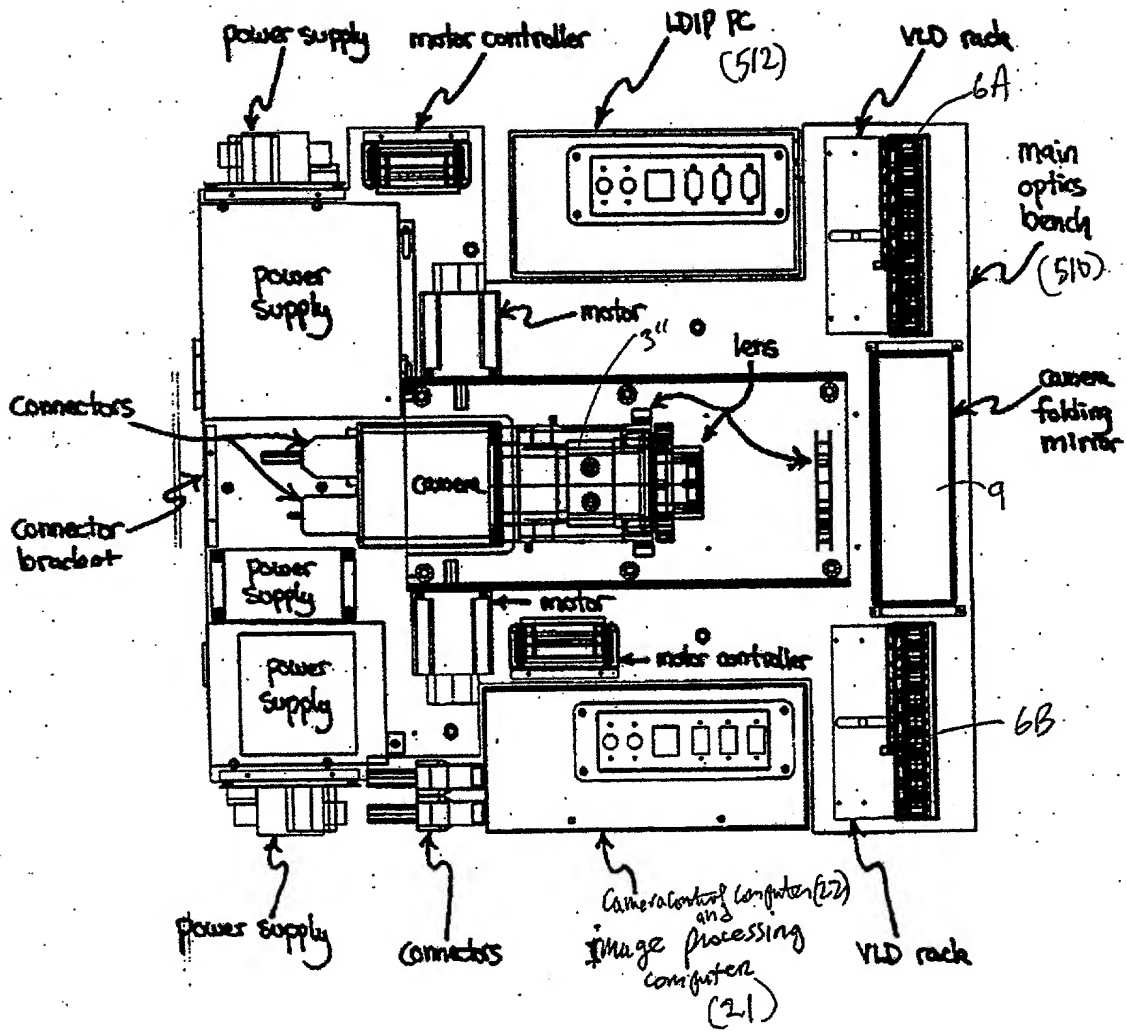


FIG. 12C

202020 2348901

212/385

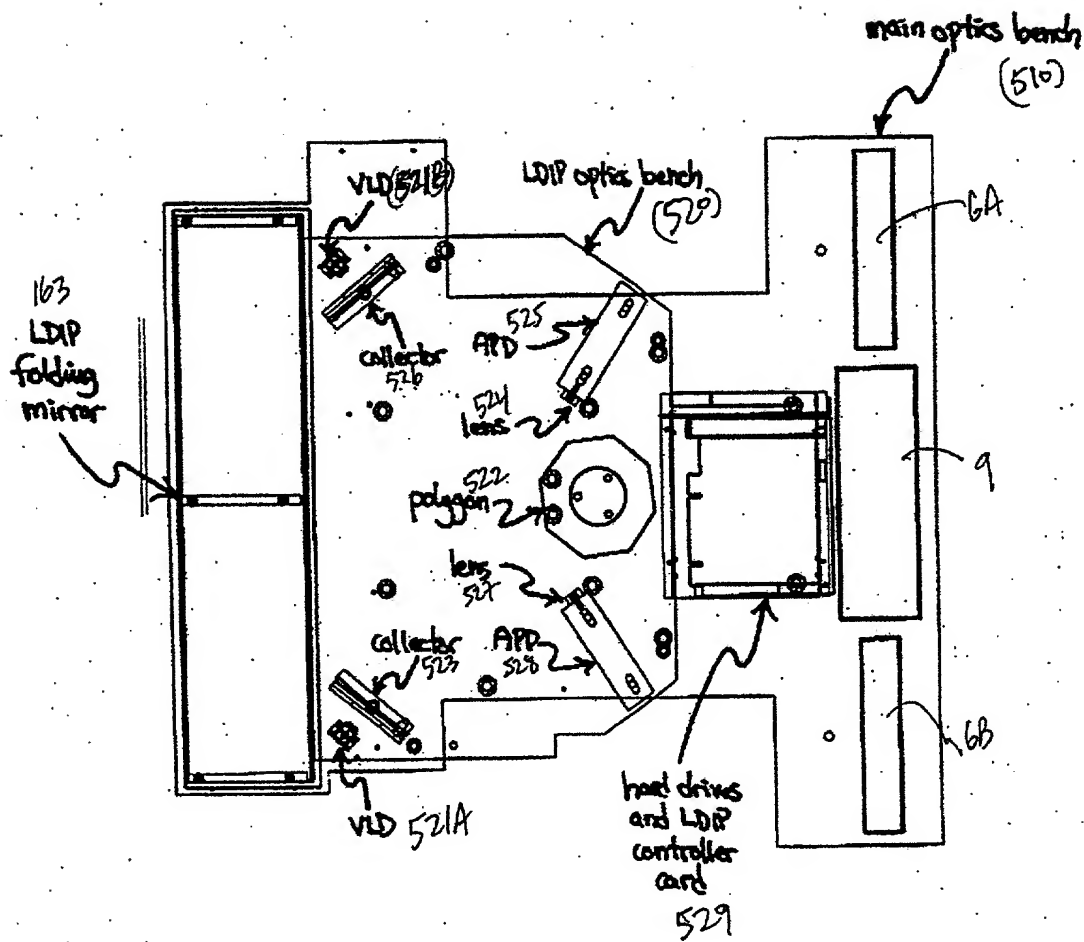
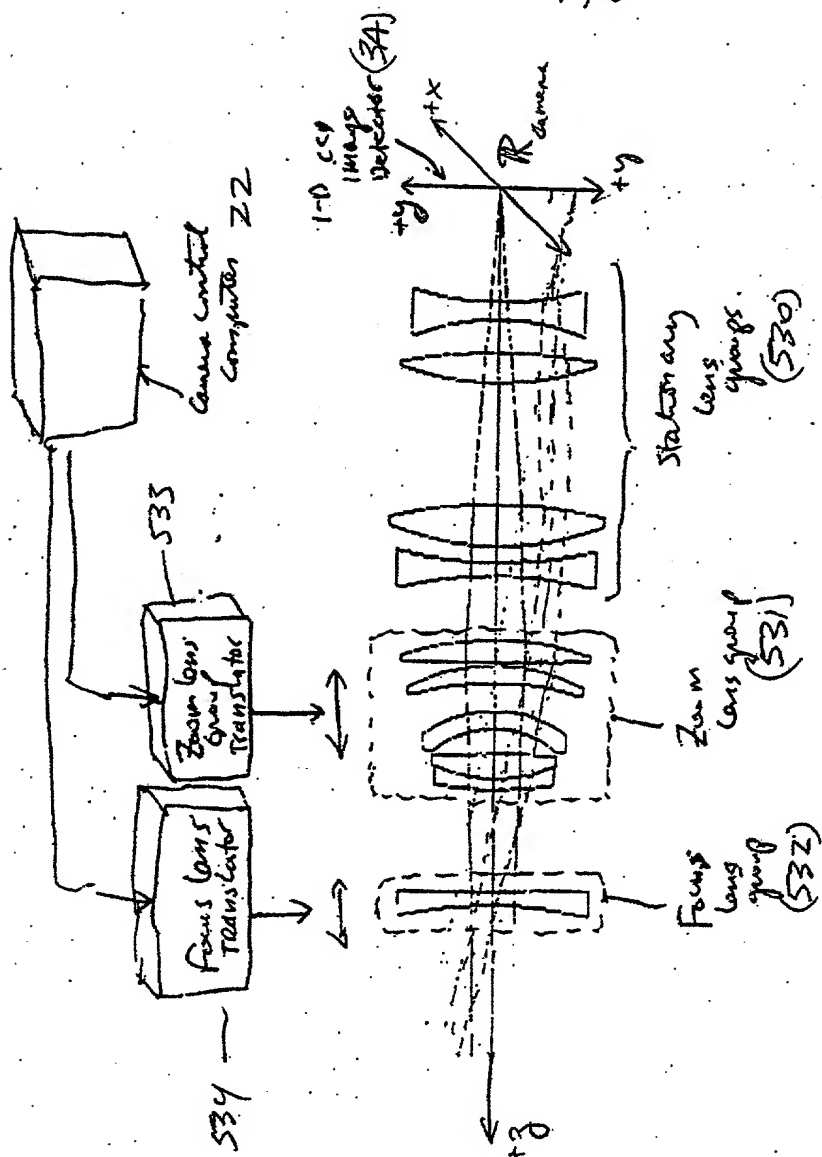


FIG. 12D

213/385



(main optics)  
(Lens groups)

FIG. 12E

214/385

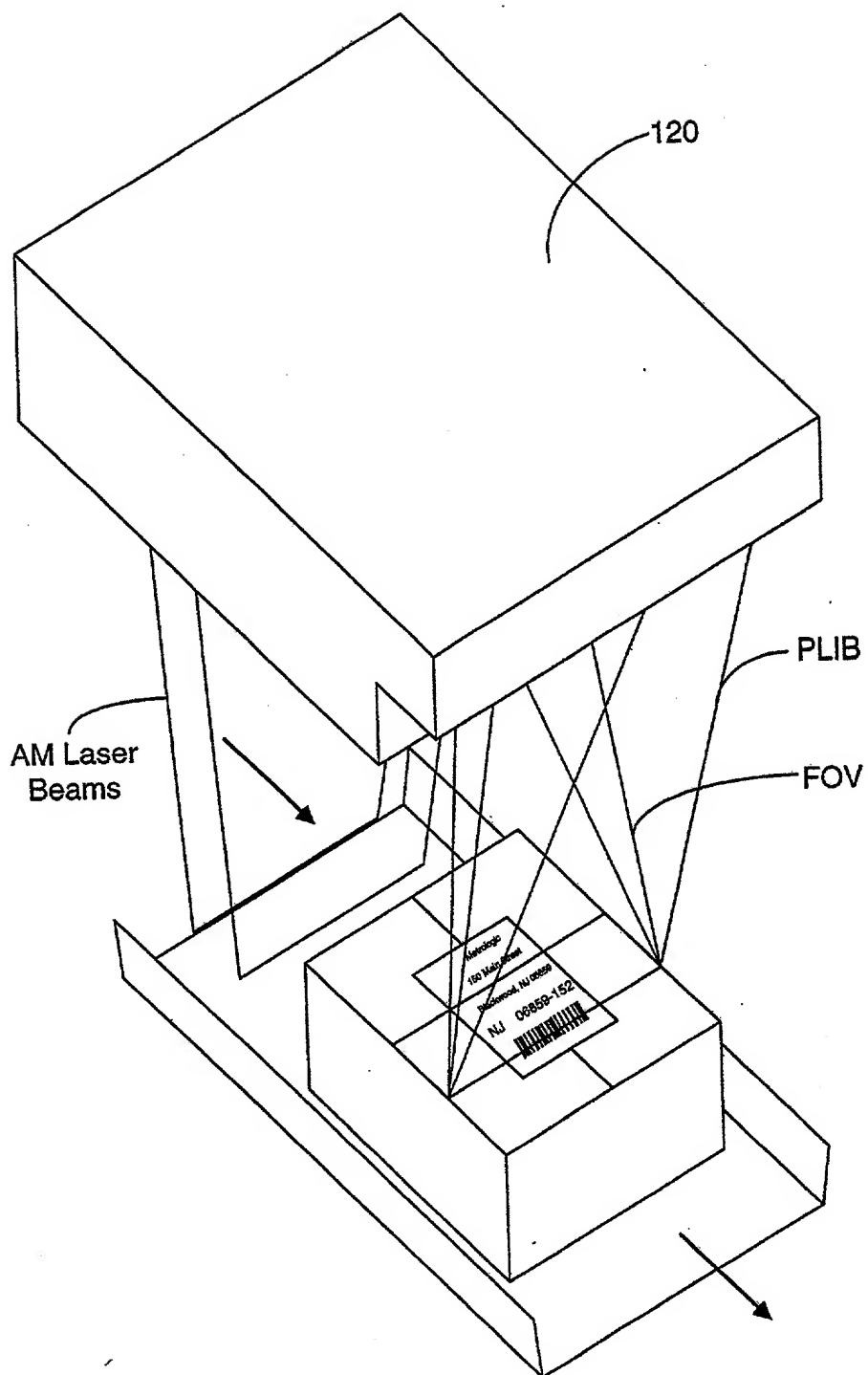


FIG. 13A

10068463.020703

215/385

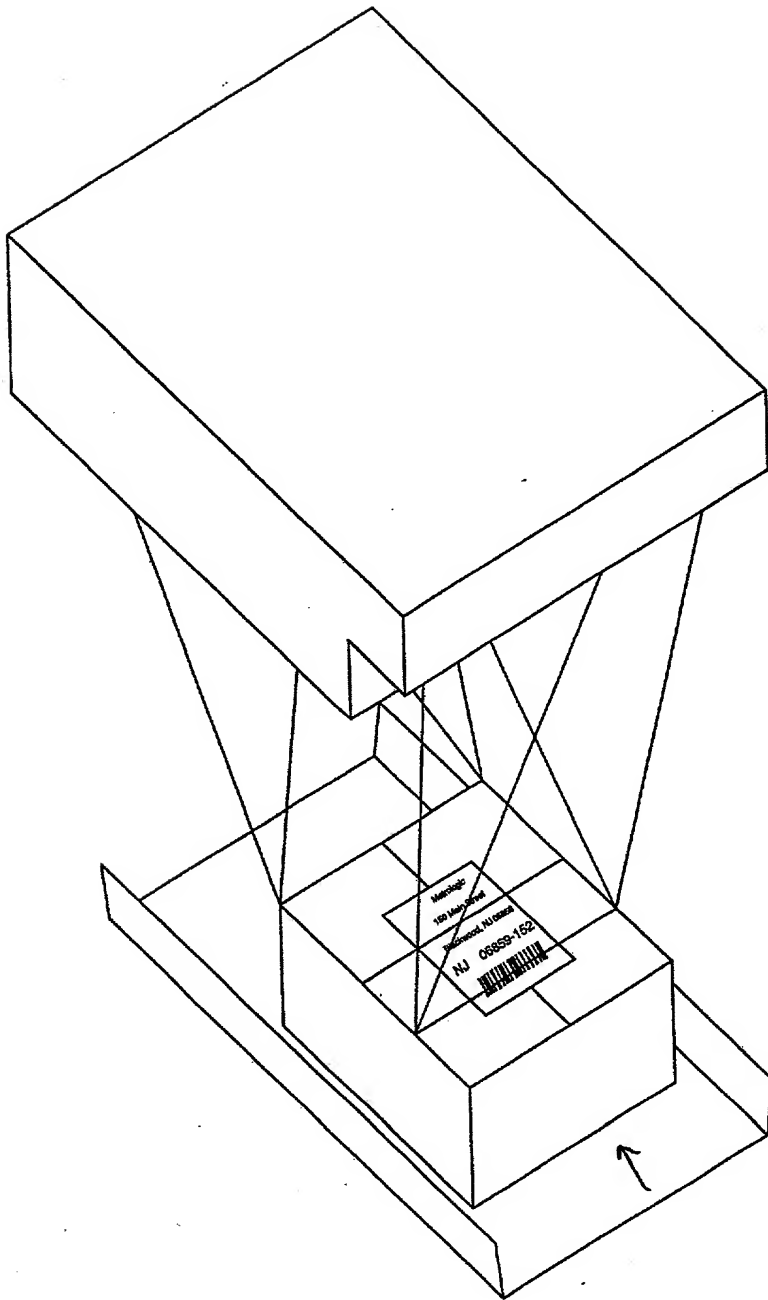


FIG. 13A

216/385

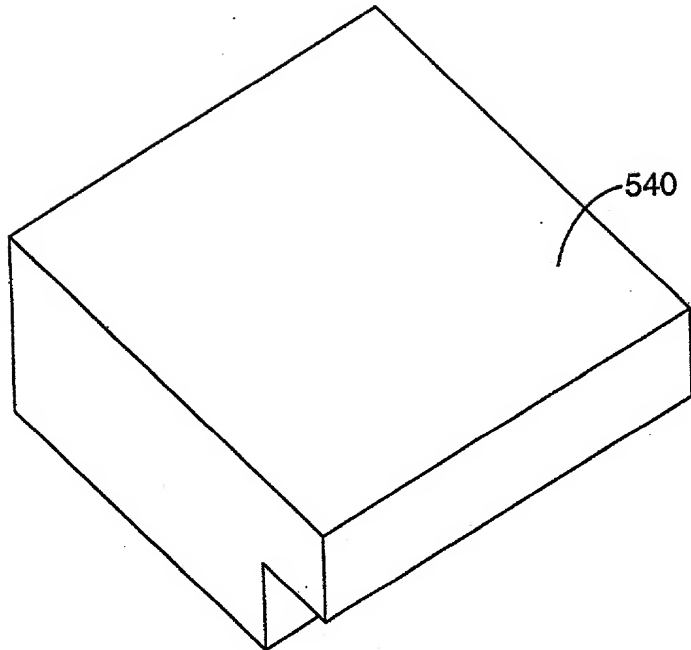


FIG. 13B

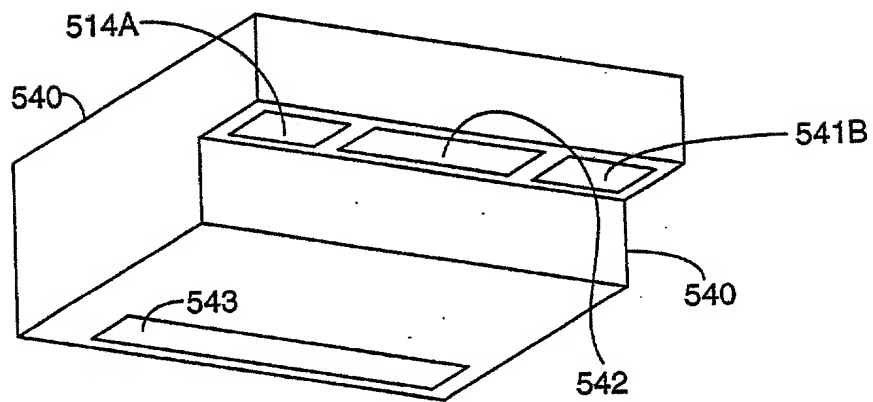


FIG. 13C

217/ 385  
 PLLIM-BASED PACKAGE IDENTIFICATION AND  
 DIMENSIONING (PID) SYSTEM

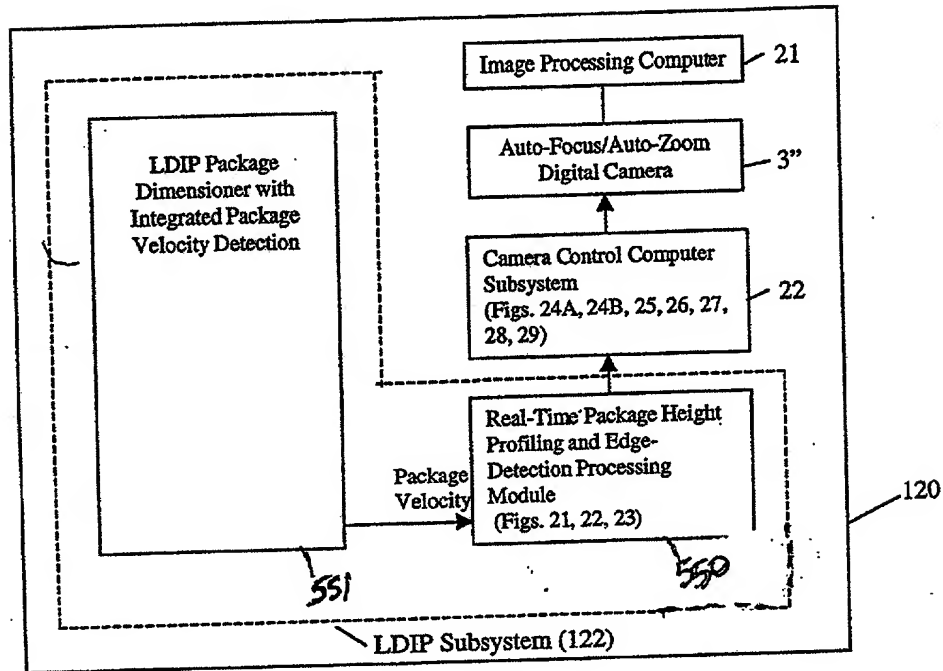


FIG. 14

218/395

# LDIP REAL-TIME PACKAGE HEIGHT PROFILE AND EDGE DETECTION METHOD

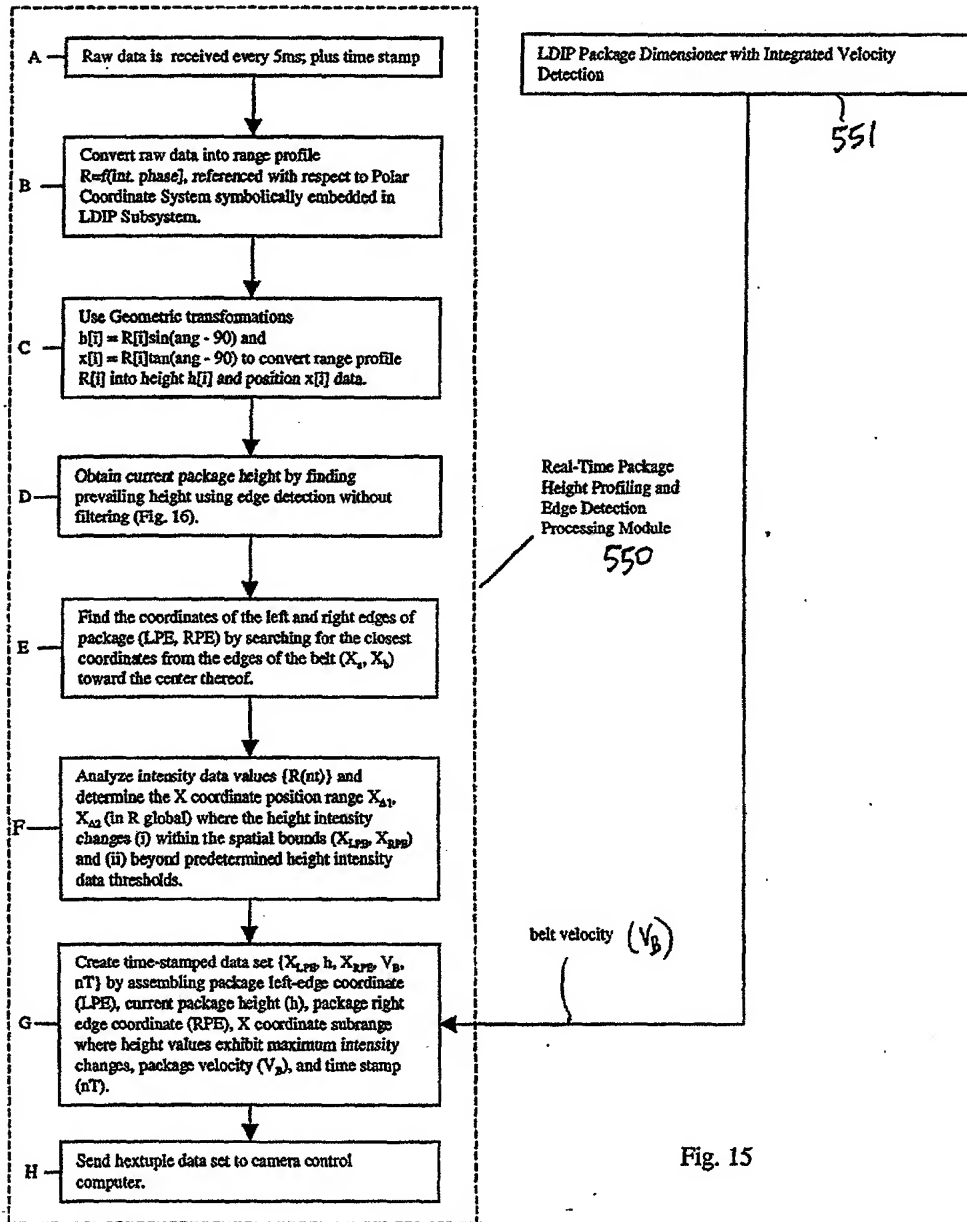
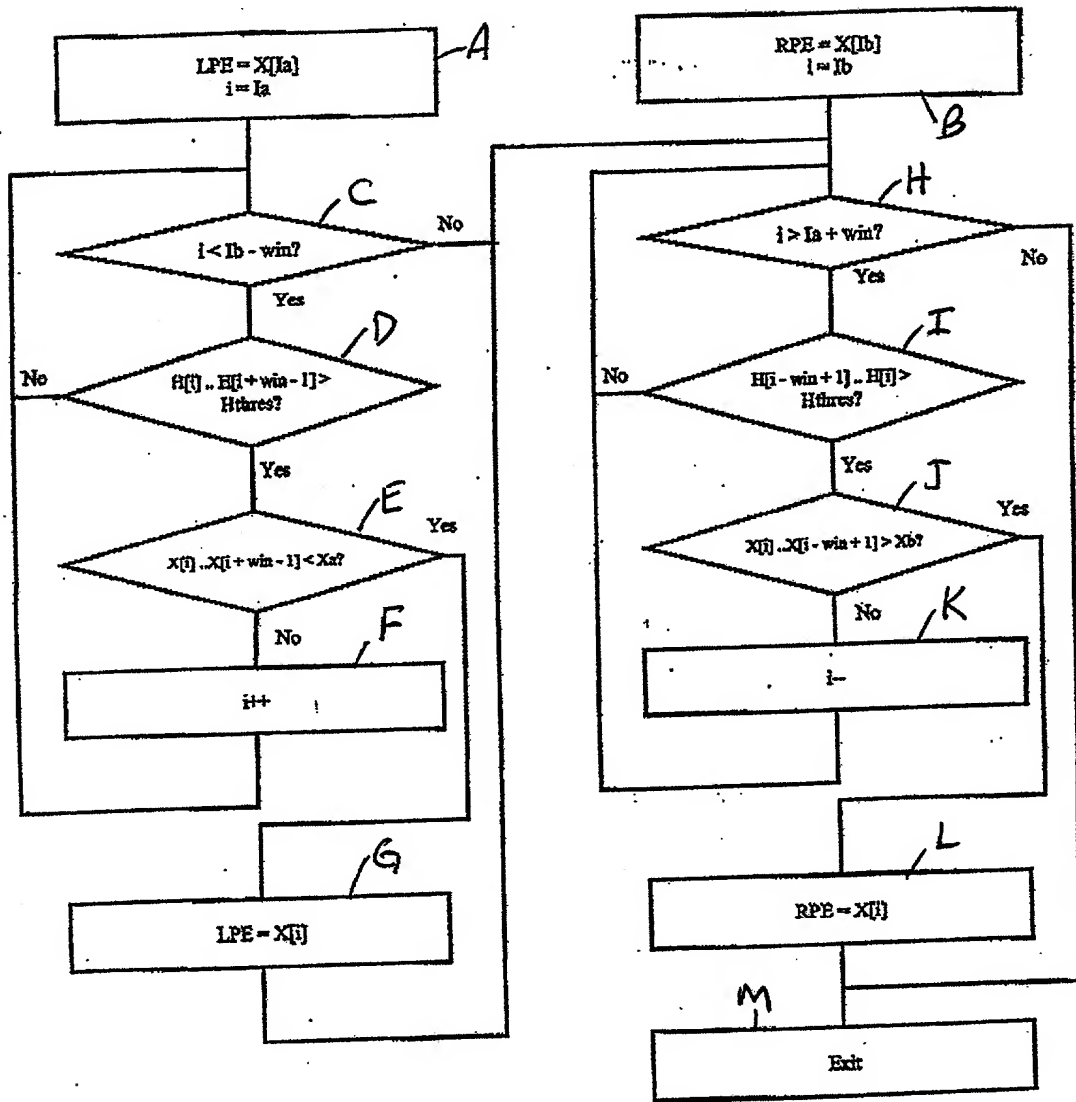


Fig. 15



219/385

# LDIP Real Time Package Edge Detection



Xa = location of belt left edge; Xb = location of belt right edge  
 Ia = belt edge edge pixel; Ib = belt right edge pixel  
 LPE = Left package edge; RPE = Right package edge  
 H[] = Pixel height array; X[] = Pixel location array  
 win = package detection window

FIG. 16

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220/385

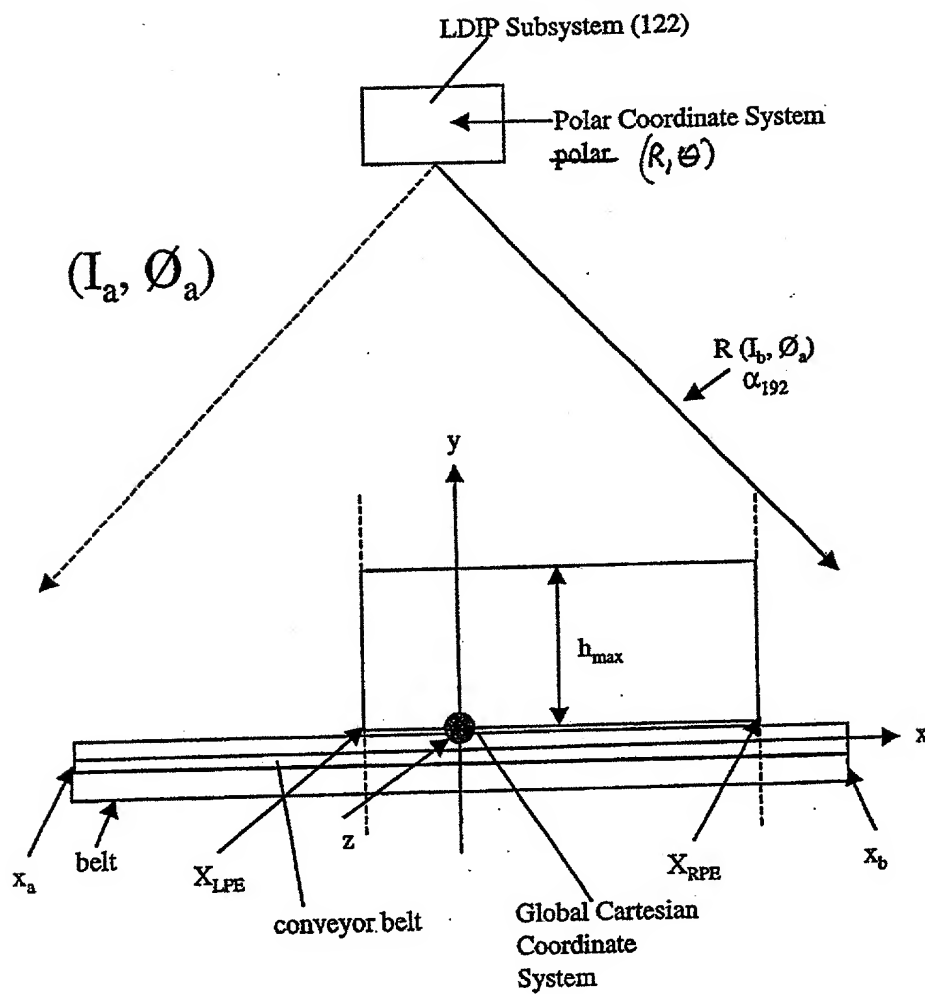


Fig. 17

22/385

# INFORMATION MEASURED AT SCAN ANGLES BEFORE COORDINATE TRANSFORMS

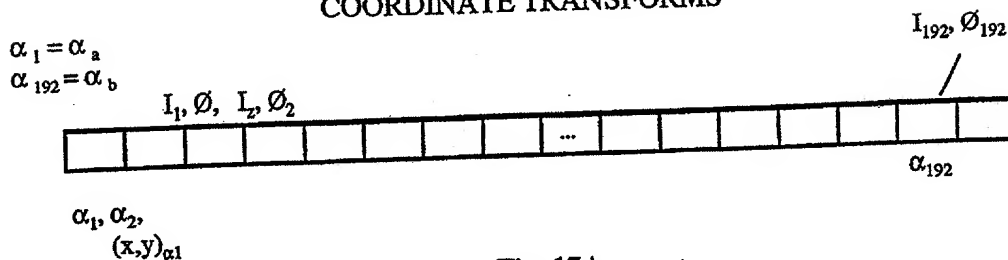


Fig. 17A

## RANGE AND POLAR ANGLE MEASURES TAKEN AT SCAN ANGLE $\alpha$ BEFORE COORDINATE TRANSFORMS

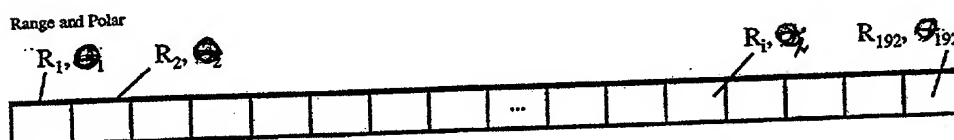


Fig. 17B

## MEASURED PACKAGE HEIGHT AND POSITION VALUES AFTER COORDINATE TRANSFORMS

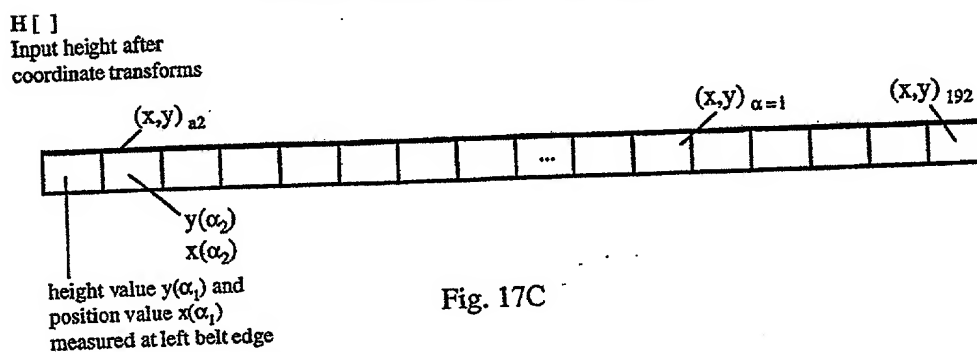


Fig. 17C

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222/385

CAMERA CONTROL PROCESS CARRIED OUT WITHIN THE CAMERA  
CONTROL SUBSYSTEM OF EACH OBJECT IDENTIFICATION AND  
ATTRIBUTE ACQUISITION SYSTEM OF PRESENT INVENTION

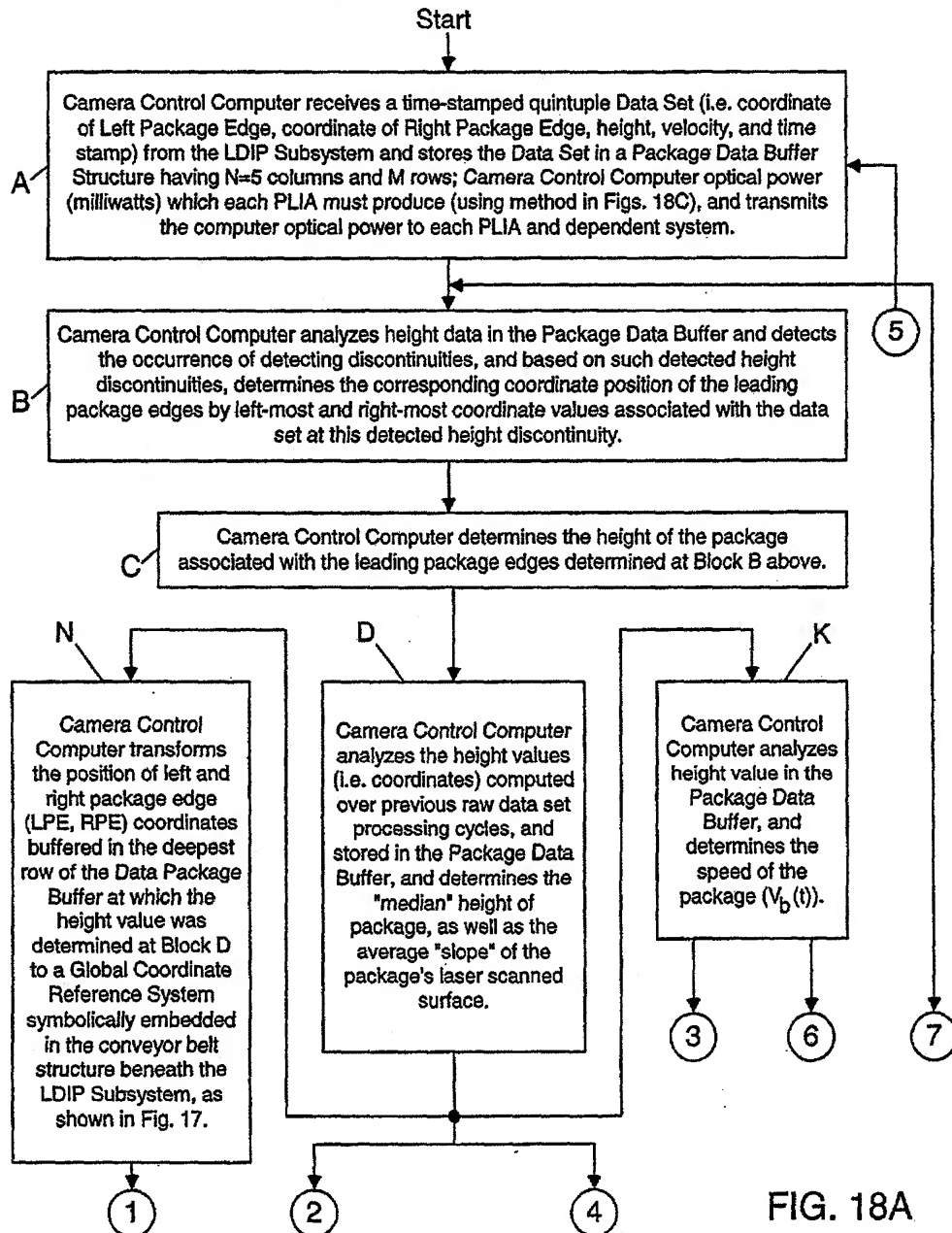


FIG. 18A

223/385

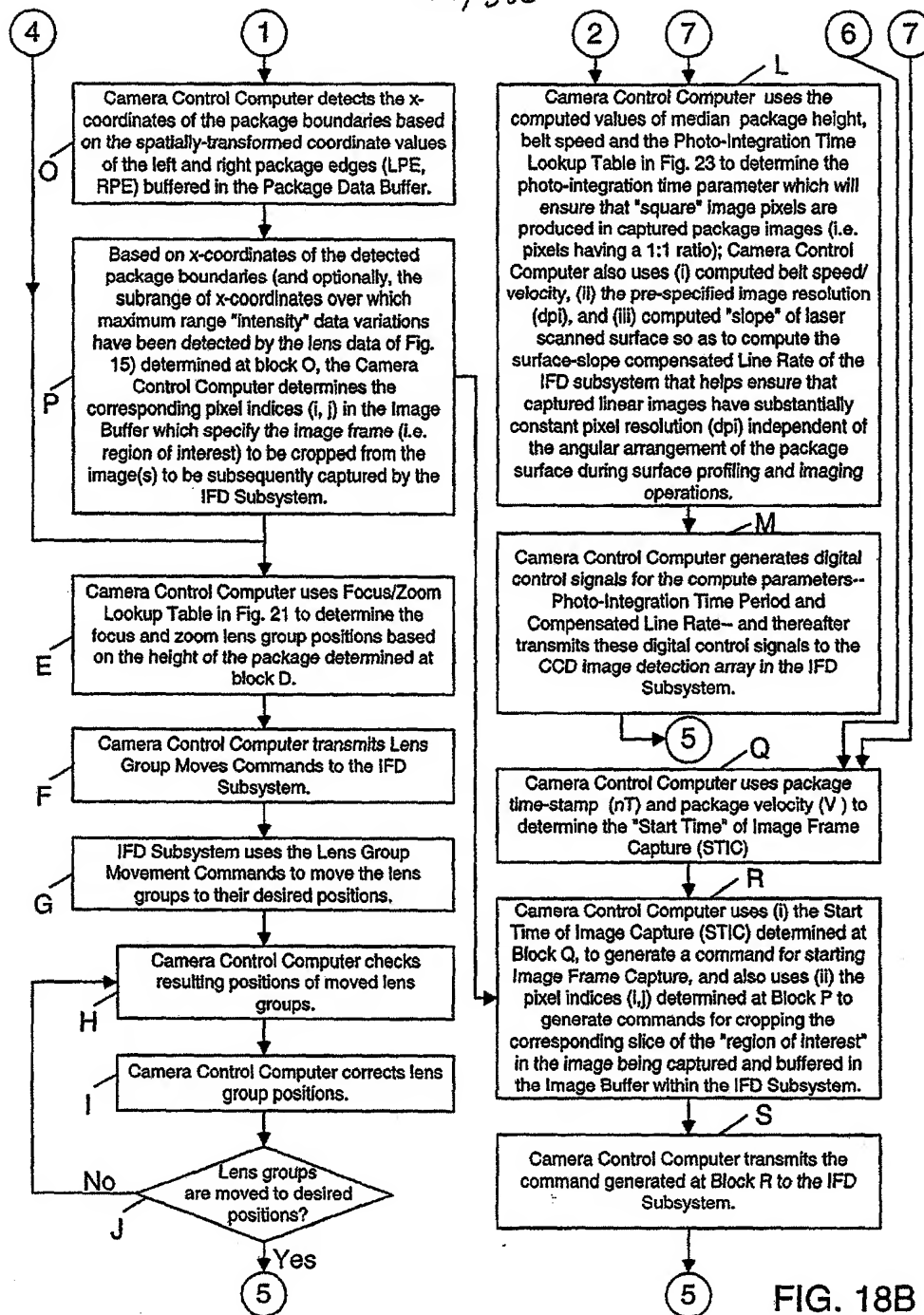


FIG. 18B

224/385

METHOD OF COMPUTING OPTICAL OUTPUT POWER FROM CASE  
DIODES IN PLANAR LASER ILLUMINATION ARRAY (PLIA) FOR  
CONTROLLING CONSTANT WHITE LEVEL IN IMAGE PIXELS CAPTURED  
BY PLIIM-BASED LINEAR IMAGER

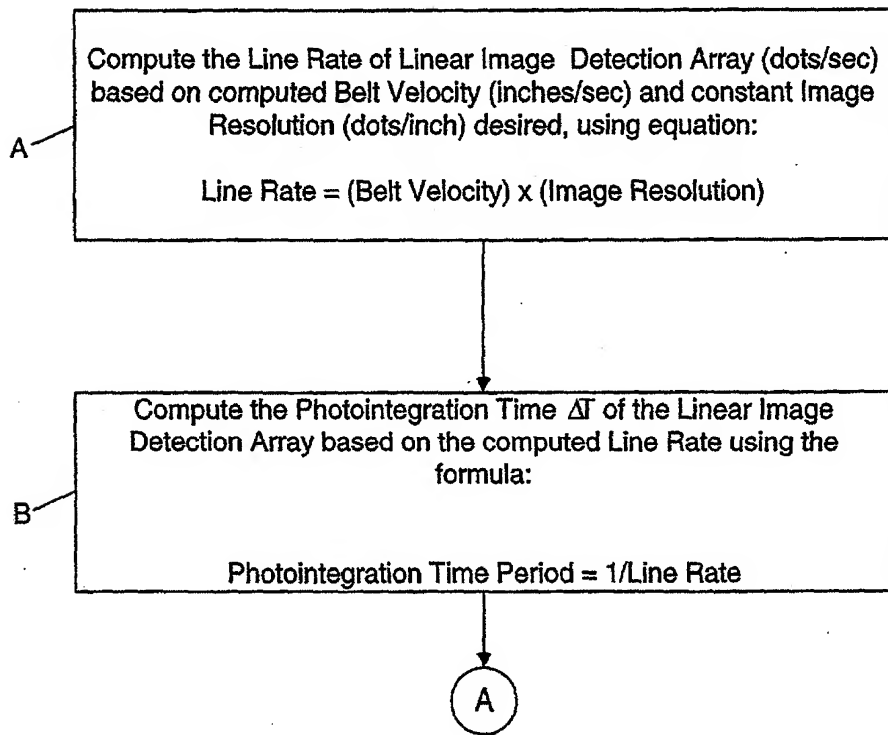


FIG. 18C1

225/385



Compute the Optical Power (milliwatts) of each PLIA based on computed Photointegration Time Period ( $\Delta T$ ) using the following formula:

$$\text{Optical Power of VLD (milliwatts)} = \frac{\text{constant}}{\text{Photointegration Time Period } \Delta T}$$

FIG. 18C2

10050453.020702

226/325

METHOD OF COMPUTING COMPENSATED LINE RATE FOR CORRECTING  
VIEWING-ANGLE DISTORTION OCCURING IN IMAGES OF OBJECT  
SURFACES CAPTURED AS OBJECT SURFACES MOVE PAST PLIIM-  
BASED LINEAR IMAGER AT NON-ZERO SKEWED ANGLE

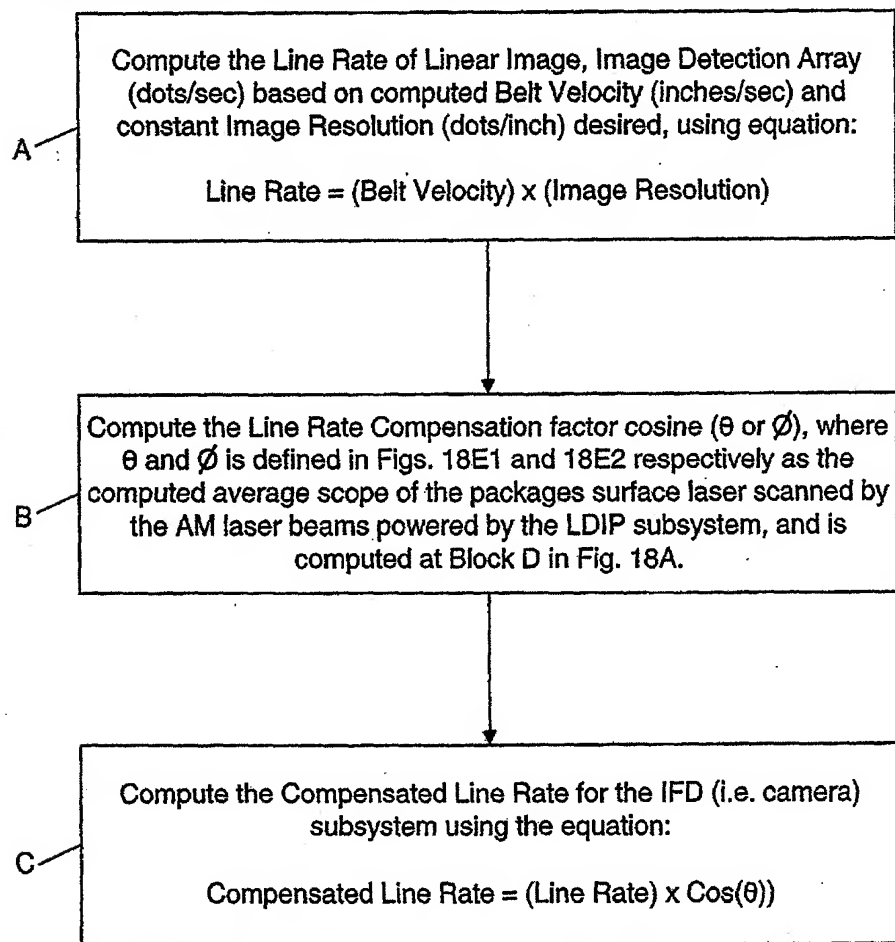


FIG. 18D



227/385

CASE 1:  
Top Down Imaging

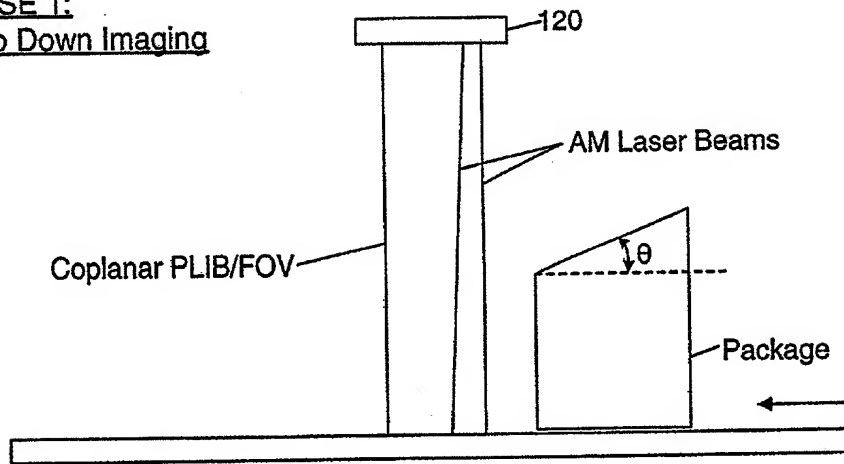


FIG. 18E1

CASE 2:  
Side Imaging

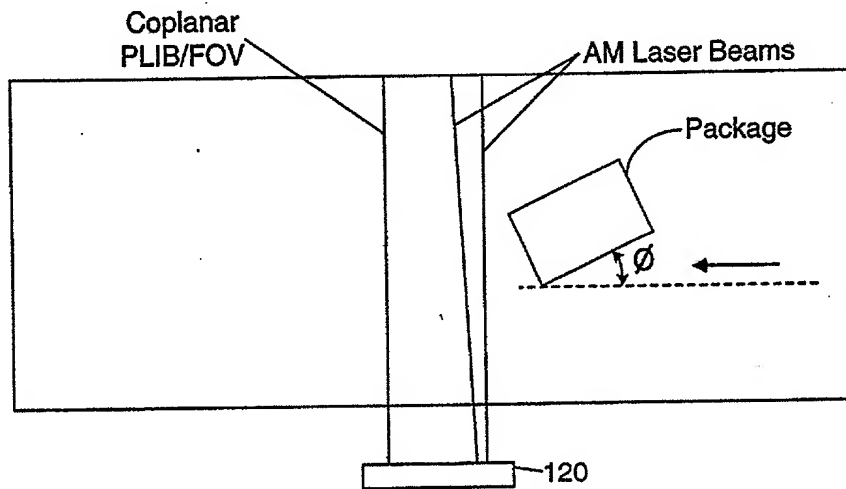


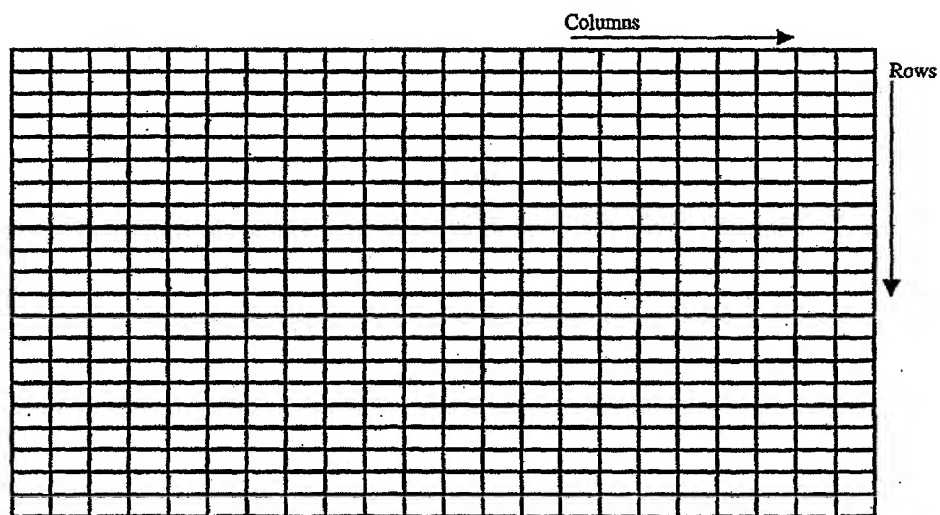
FIG. 18E2

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X coordinate subrange where maximum range "intensity" variations have been detected

Camera Pixel Data Buffer  
pixel indices (i,j)

Fig. 20



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229/385

Zoom and Focus Lens Group Position  
Looking Table

Distance from Camera H (mm)	Zoom group distance (mm) Y (Zoom)	Focus group distance (mm) Y (Focus)
1000	21.57489228	2.47E-05
1100	19.38089696	10.99009783
1200	17.10673434	20.65783177
1300	14.77137314	29.10917002
1400	12.39153565	36.47312595
1500	9.979114358	42.87845436
1600	7.540639114	48.44003358
1700	5.078794775	53.25495831
1800	2.595989366	57.40834303
1900	0.099972739	60.98863615

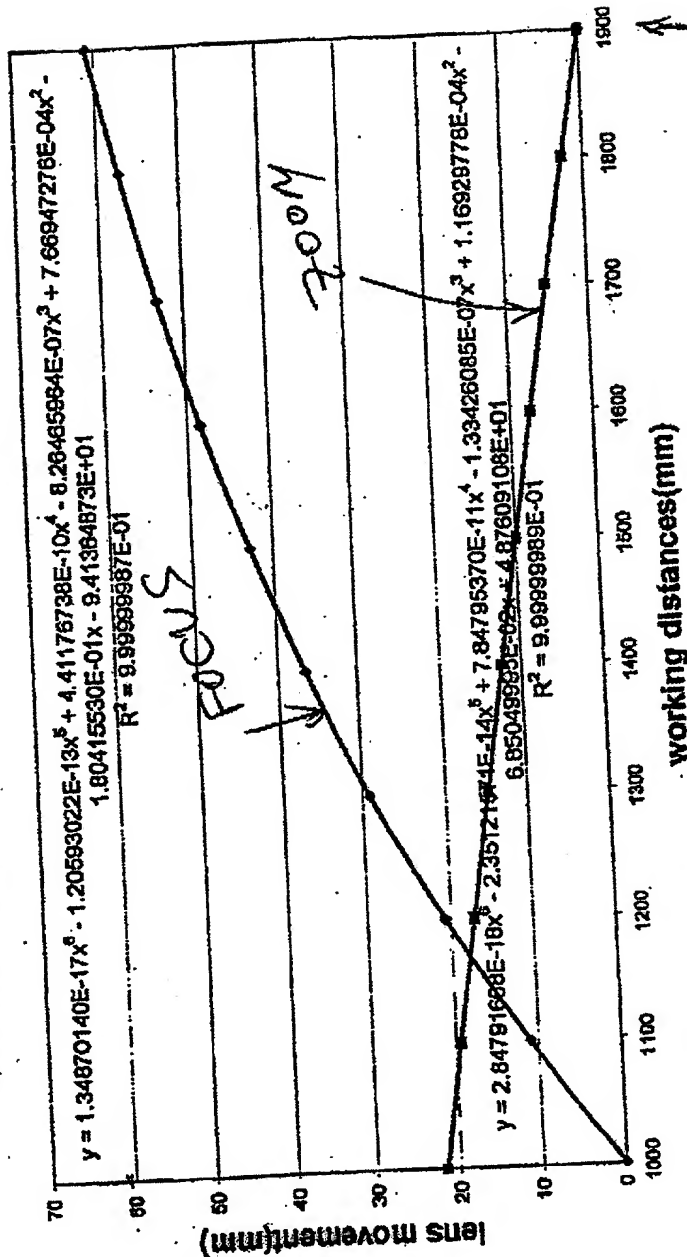
FIG. 21.

(Use  
interpolation  
techniques  
for working  
distances  
between listed  
points in  
table)

230/385

\* Note: On feed distance & zoom (left feed length) in camera lens are coupled (interdependent) in camera has a fixed aperture F5.6  
 this camera is binocular

# Focus and Zoom lens movement vs. working distances



Conveyor-belt surface

← Package height above conveyor

30 above conveyor belt

FIG. 22A

20/02/2020 10:54:30

231/385

Photo-Integration Time Look-Up Table

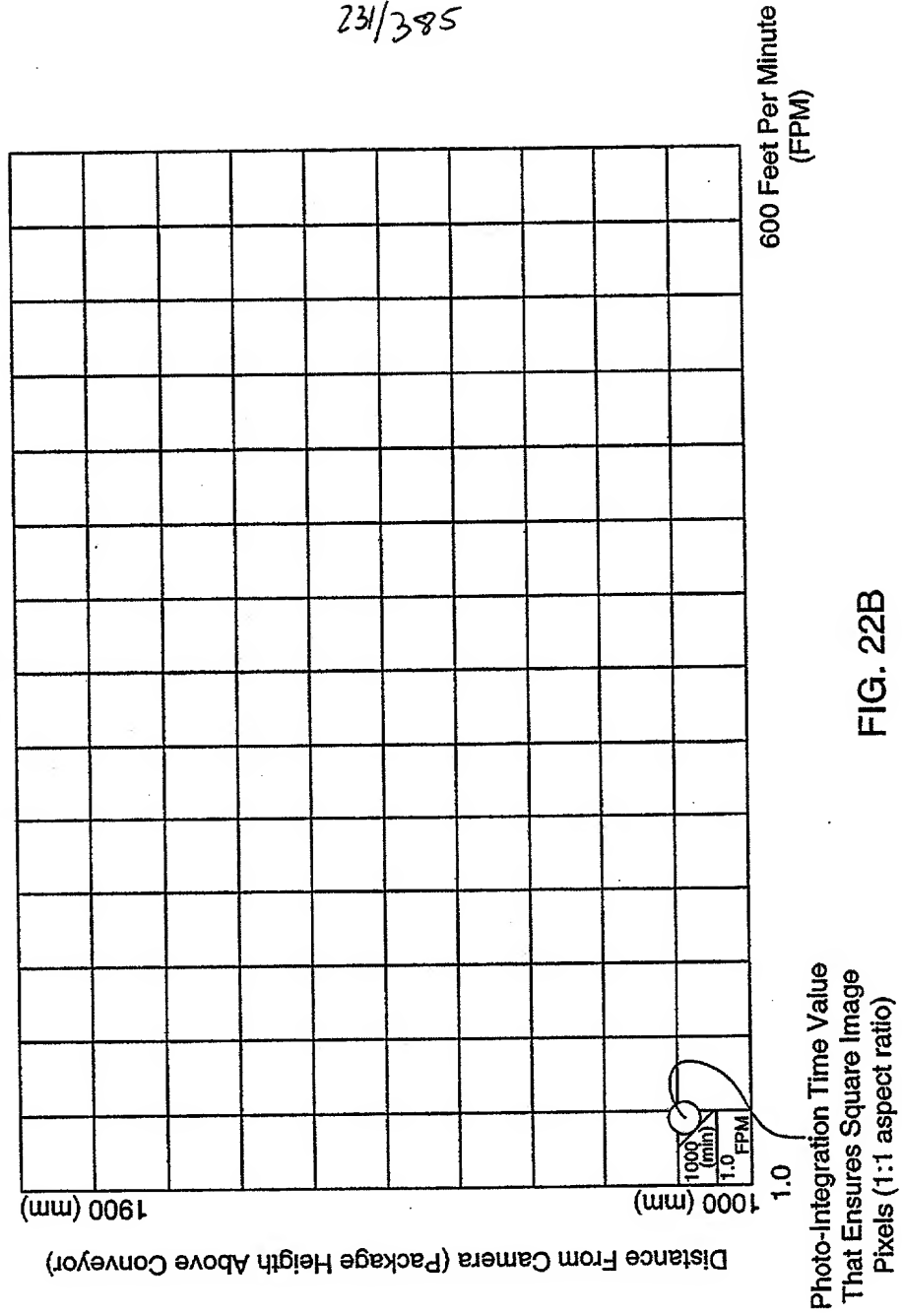


FIG. 22B

232/385

3D Surface Profile And High Resolution  
Linear Image Data Capture  
At PLIIM-Based Profiling  
And Imaging System

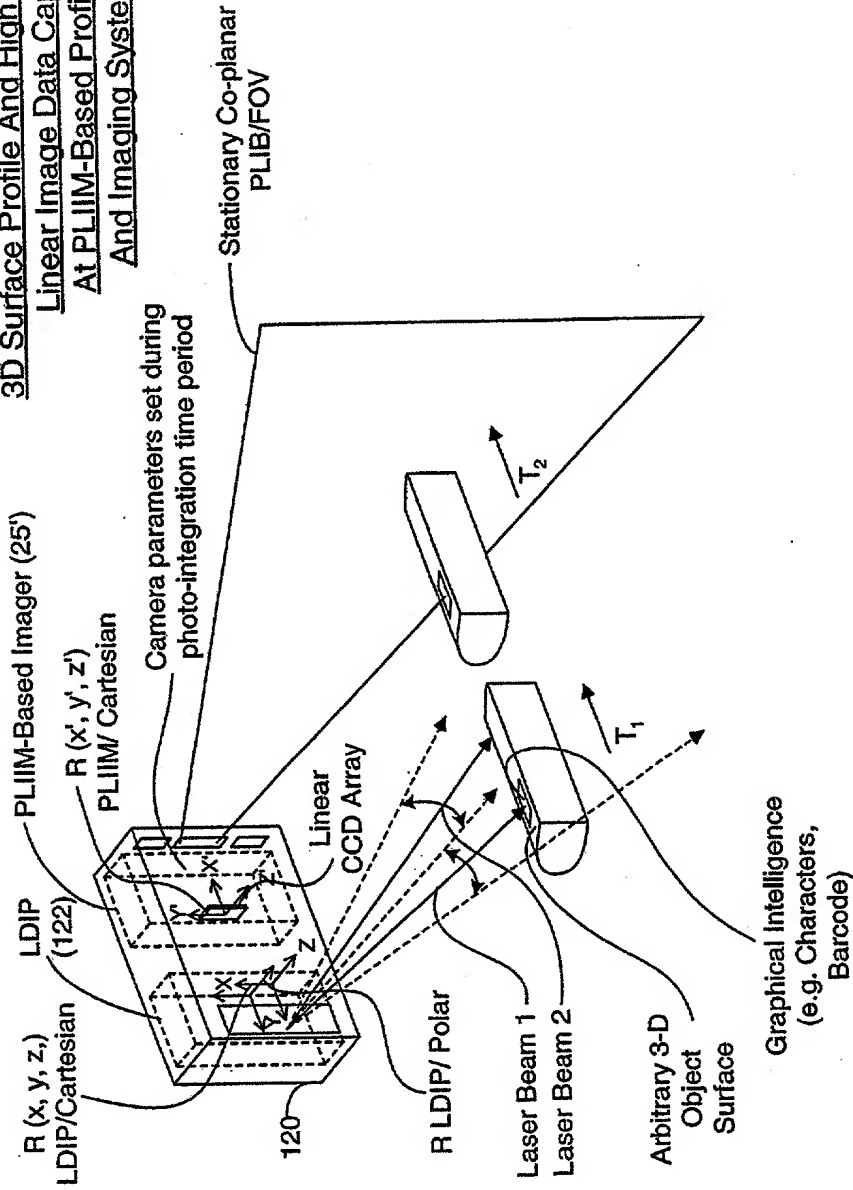
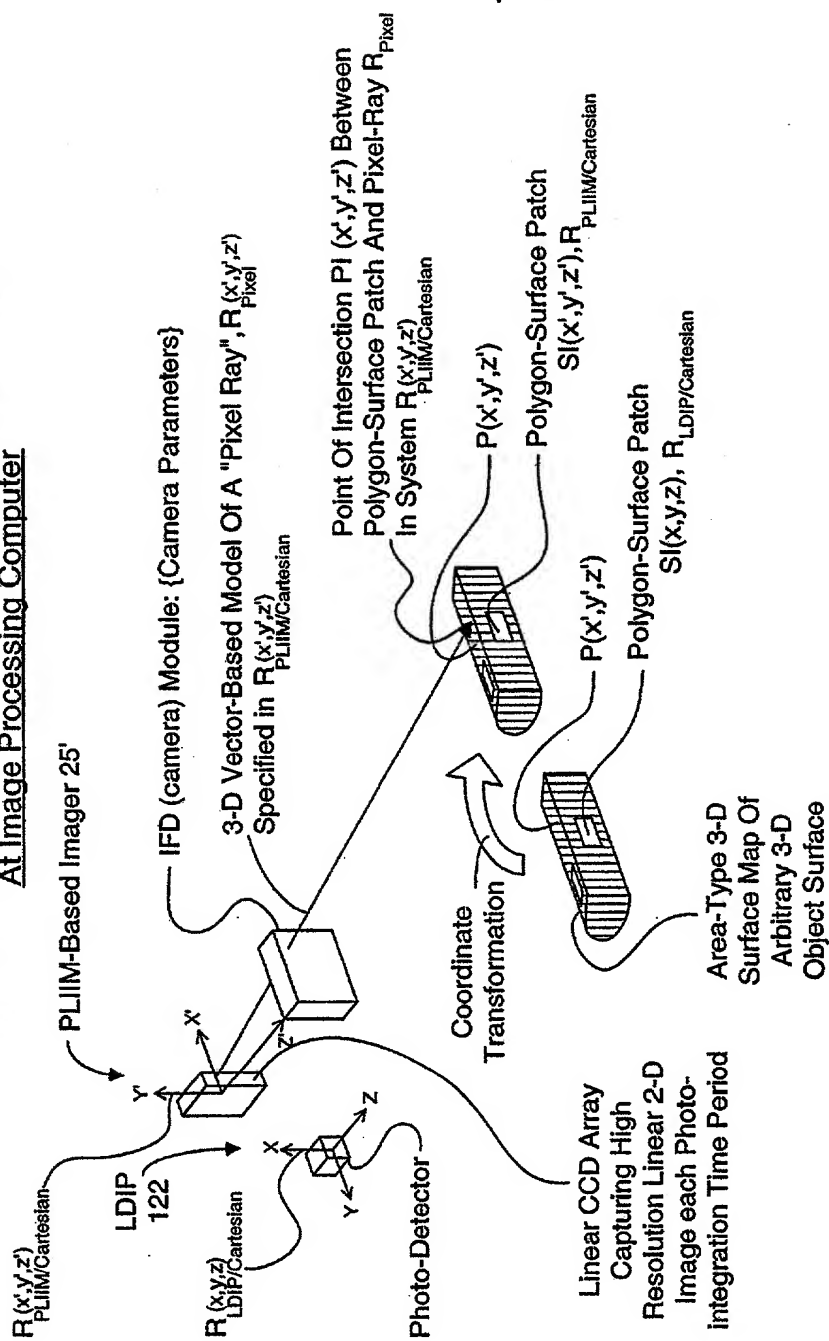


FIG. 23A

# Geometrical Modelling Of Arbitrary 3-D Object Surface At Image Processing Computer



**FIG. 23B**

234/385

METHOD OF AND APPARATUS FOR PERFORMING AUTOMATIC  
RECOGNITION OF GRAPHICAL INTELLIGENCE CONTAINED IN 2-D  
IMAGES CAPTURED FROM ARBITRARY 3-D OBJECT SURFACES

STEP 1: At the unitary PLIIM-based object imaging and profiling system, use the laser doppler imaging and profiling (LDIP) subsystem employed therein to (i) consecutively capture a series of linear 3-D surface profile maps on a targeted arbitrary (e.g. non-planar or planar) 3-D object surface bearing forms of graphical intelligence and (ii) measure the velocity of the arbitrary 3-D object surface, wherein the polar coordinates of each point in the captured linear 3-D surface profile map are specified in a local polar coordinate system  $R_{LDIP/polar}$ , symbolically embedded within the LDIP subsystem.

A

STEP 2: At the unitary PLIIM-based object imaging and profiling system, use coordinate transforms to automatically convert the polar coordinates of each point  $p(\alpha, R)$  in the captured linear 3-D surface profile map into  $x, y, z$  Cartesian coordinates specified as  $p(x, y, z)$  in a local Cartesian coordinate system  $R_{LDIP/Cartesian}$ , symbolically embedded within the LDIP subsystem.

B

STEP 3: At the unitary PLIIM-based object imaging and profiling system, use the PLIIM-based imager employed therein to consecutively capture high-resolution linear 2-D images of the arbitrary 3-D object surface bearing forms of graphical intelligence (e.g. symbol character strings), wherein (i) the  $x', y'$  coordinates of each pixel in each said captured high-resolution linear 2-D image is specified in local Cartesian coordinate system  $R_{PLIIM/Cartesian}$  symbolically embedded within the PLIIM-based imager, and (ii) the intensity value of the pixel  $I(x', y')$  is associated with the  $x', y'$  Cartesian coordinates of the image detection element in the linear image detection array at which the pixel is detected, and (iii) wherein also the planar laser illumination beam (PLIB) of the PLIIM-based imager is spaced from the amplitude modulated (AM) laser scanning beam of the LDIP subsystem is about D centimeters.

C

A

FIG. 23C1

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235/385  
A

STEP 4: At the unitary PLIIM-based object imaging and profiling system, capture and buffer the camera (IFD) parameters used to form and detect each linear high-resolution 2-D image captured during the corresponding photo-integration time period  $\Delta T_K$ , by the PLIIM-based imager.

D

STEP 5: At the end of each photo-integration time period  $\Delta T_K$ , use the unitary PLIIM-based object imaging and profiling system to transmit the following information elements to the Image Processing Computer for data storage and subsequent information processing:

- (1) the converted coordinates  $x, y, z$ , of each point in the linear 3-D surface profile map of the arbitrary 3-D object surface captured during photo-integration time period  $\Delta T_K$ ;
- (2) the measured velocity(ies) of the arbitrary 3-D object surface during photo-integration time period  $\Delta T_K$ ;
- (3) the  $x', y'$  coordinates and intensity value  $I(x', y')$  of each pixel in each high-resolution linear 2-D image captured during photo-integration time period  $\Delta T_K$  and specified in the local Cartesian coordinate system  $R_{PLIIM/Carthesian}$ ; and
- (4) the captured camera (IFD) parameters used to form and detect each linear high-resolution 2-D image captured during the photo-integration time period  $\Delta T_K$

E

STEP 6: At the Image Processing Computer, receive the data elements transmitted from the PLIIM-based profiling and imaging system durin Step 5, buffer data elements (1) and (2) in a first FIFO buffer memory structure, and data elements (3) and (4) in a second FIFO buffer memory structure.

F

B

FIG. 23C2

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236/385

(B)

STEP 7: At the Image Processing Computer, use the  $x, y, z$  coordinates associated with a consecutively captured series of linear 3-D surface profile maps (i.e. stored in first FIFO memory storage structure) in order to construct a 3-D polygon-mesh surface representation of said arbitrary 3-D object surface, represented by  $S_{LDIP}(x, y, z)$  and having (i) vertices specified by  $x, y, z$  in local coordinate reference system  $R_{PLIIM/Carthesian}$ , and (ii) planar polygon surface patches  $s_i(x, y, z)$  and being defined by a set of said vertices.

G

STEP 8: At the Image Processing Computer, convert the  $x', y', z'$  coordinates of each vertex in the 3-D polygon-mesh surface representation into the local Cartesian coordinate reference system  $R_{PLIIM/Carthesian}$  symbolically embedded within the PLIIM-based imager.

H

STEP 9: At the Image Processing Computer, specify the  $x', y', z'$  coordinates of each  $i$ -th planar polygon surface patch  $s(x, y, z)$  represented in the local Cartesian coordinate reference system  $R_{PLIIM/Carthesian}$ , so as to produce a set of corresponding polygon surface patch  $\{s_i(x', y', z')\}$  represented in system  $R_{PLIIM/Carthesian}$

I

STEP 10: At the Image Processing Computer, for a selected linear high-resolution 2-D image captured at photo-integration time period  $\Delta T_K$ , and spatially corresponding to one of the linear 3-D surface profile maps employed at Step 7, use the camera (IFD) parameters used and recorded (i.e. captured) during the corresponding photo-integration time period in order to construct a 3-D vector-based "pixel ray" model specifying the optical formation of each pixel in the linear 2-D image, wherein a pixel ray reflected off a point on the arbitrary 3-D object surface is focused through the camera's image formation optics (i.e. configured by the camera parameters) and is detected at the pixel's detection element in the linear image detection array of the IFD (camera) subsystem.

J

(C)

FIG. 23C3

237/385  
C

STEP 11: At the Image Processing Computer, for each laser beam ray (producing one of the pixels in said selected linear 2-D image), (i) determine which polygon surface patch  $s_i(x, y, z)$  the pixel ray intersects, (ii) compute the  $x, y, z$  coordinates of the point of intersection (POI) between the pixel ray and the polygon surface patch represented in Cartesian coordinate reference system  $R_{PLIIM/Cartesian}$ , and (iii) designate the computed set of points of intersection as  $\{p_i(x, y, z)\}$ .

K

STEP 12: At the Image Processing Computer, for each laser beam ray passing through a determined polygon surface patch  $s(x', y', z')$  at a computed point of intersection  $p_i(x, y, z)$ , assign the intensity value  $I(x', y')$  of the pixel ray to the  $x', y', z'$  coordinates of the point of intersection, thereby producing a linear high-resolution 3-D image comprising a 2-D array of pixels, each said pixel pixel having as its attributes (i) an Intensity value  $I(x', y', z')$  and (ii) coordinates  $x', y', z'$  specified in the local Cartesian coordinate reference system  $R_{PLIIM/Cartesian}$ .

L

STEP 13: Put the computed linear high-resolution 3-D image in a third FIFO memory storage structure in the image processing computer.

M

STEP 14: Repeat Steps 1-6 to update the first and second FIFO data queues maintained in the image processing computer, and Steps 7-13 to update the consecutively computed linear high-resolution 3-D image stored in the third FIFO memory storage structure.

N

STEP 15: Assemble in an image buffer in the image processing computer, a set of consecutively computed linear high-resolution 3-D images retrieved from the third FIFO data storage device so as to construct an "area-type" high-resolution 3-D image of said arbitrary 3-D object surface.

O

D

FIG. 23C4

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(D)

238/385

STEP 16: At the Image Processing Computer, map the intensity value  $I(x', y', z')$  of each pixel in the computed area-type 3-D image onto the  $x', y', z'$  coordinates of the points on a uniformly-spaced apart "grid" positioned perpendicular to the optical axis of the camera subsystem (i.e. to model the 2-D planar substrate on which the forms of graphical intelligence was originally rendered), wherein said mapping process involves using an intensity weighing function based on the  $x', y', z'$  coordinate values of each pixel in the area-type high-resolution 3-D image, thereby producing an area-type high-resolution 2-D image of the 2-D planar substrate surface bearing said forms of graphical intelligence (e.g. symbol character strings).

P

STEP 17: At the Image Processing Computer, use said OCR algorithm to perform automated recognition of graphical intelligence contained in said area-type high-resolution 2-D image of said 2-D planar substrate surface so as to recognize said graphical intelligence and generate symbolic knowledge structures representative thereof.

Q

STEP 18: Repeat Steps 1-17 as often as required to recognize changes in graphical intelligence on the arbitrary moving 3-D object surface.

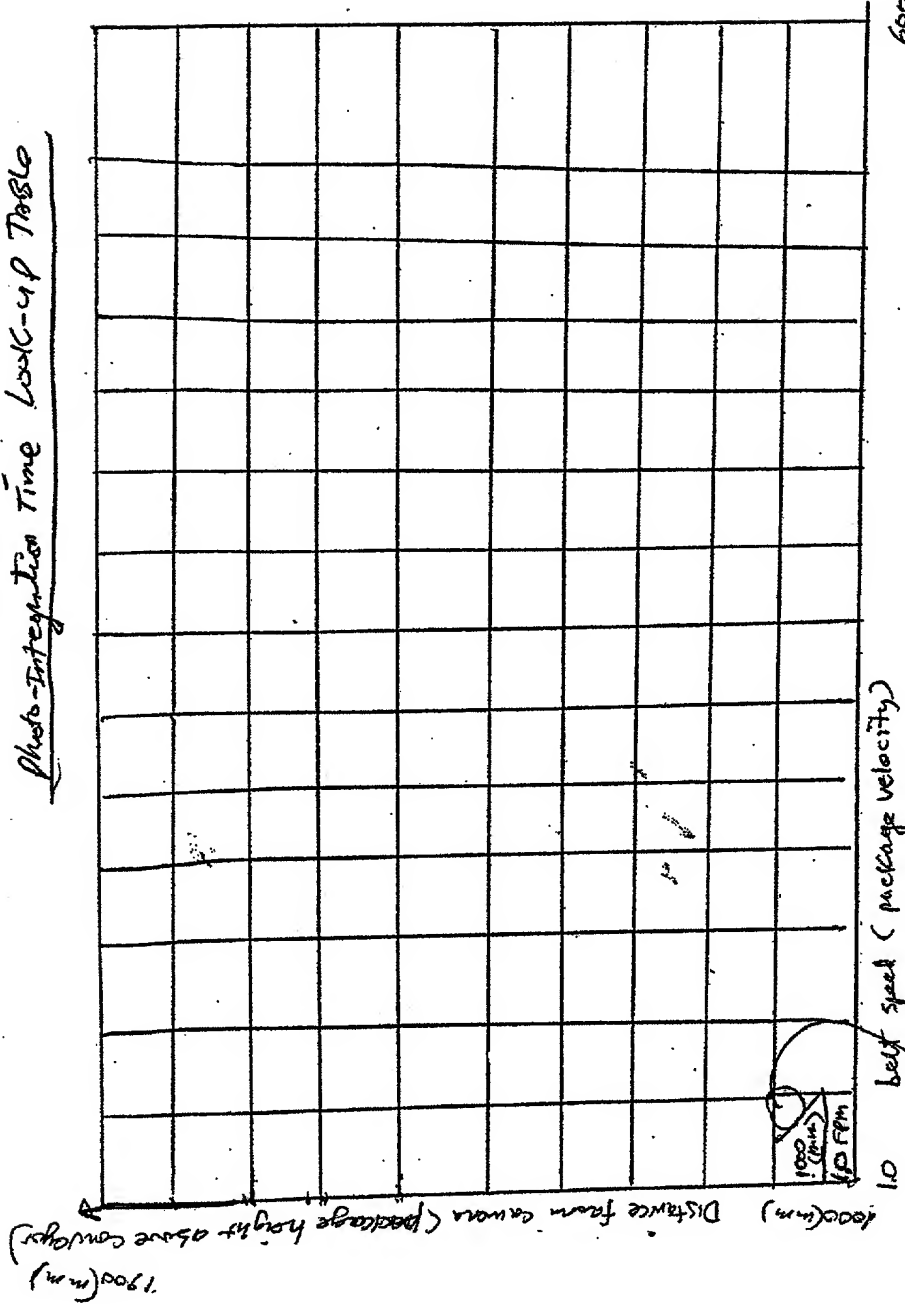
R

FIG. 23C5

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239/385

Photo-Integration Time Look-up Table



600 feet per minute  
(FPM)

FIG. 22B

Photo-integration  
Time values that  
ensures square image pixels  
(1:1 aspect ratio)

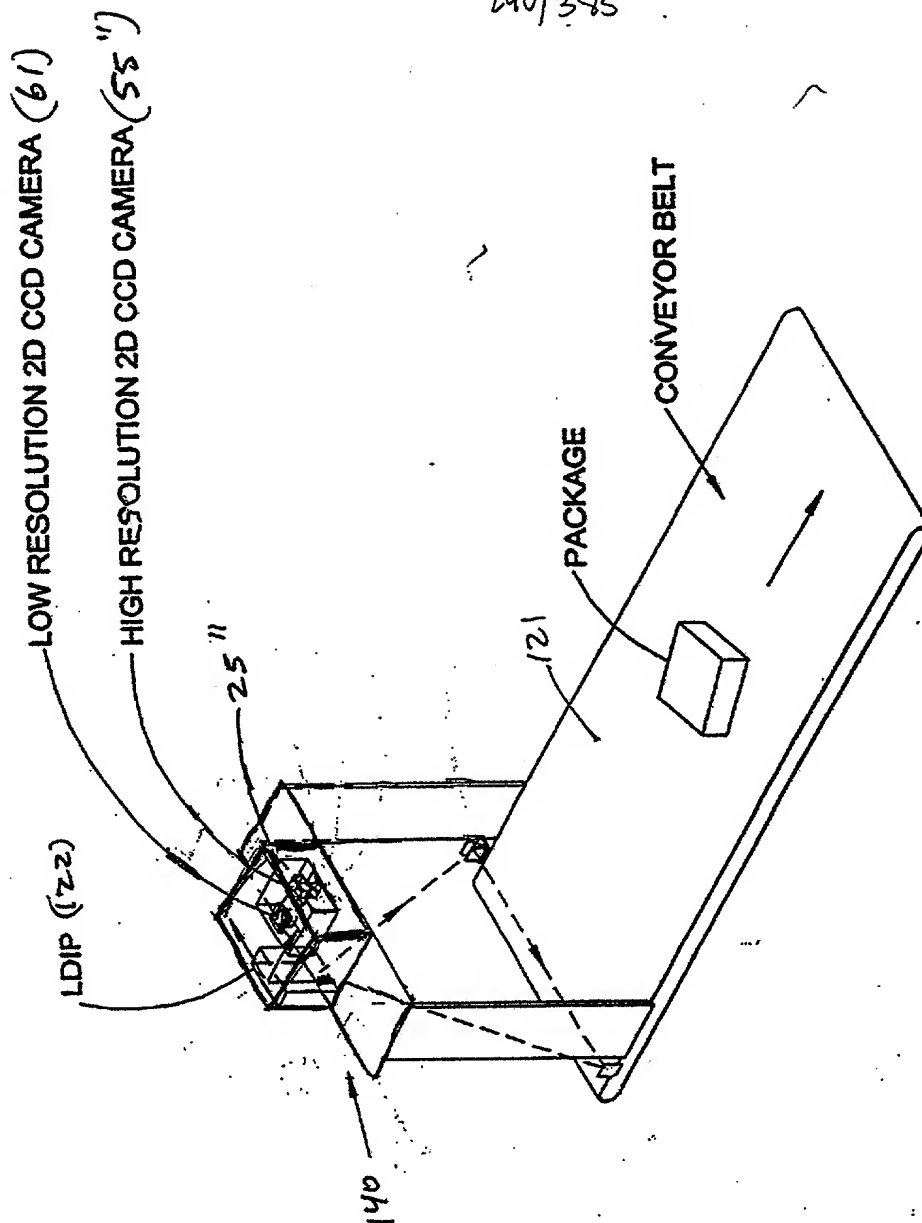


FIG 24

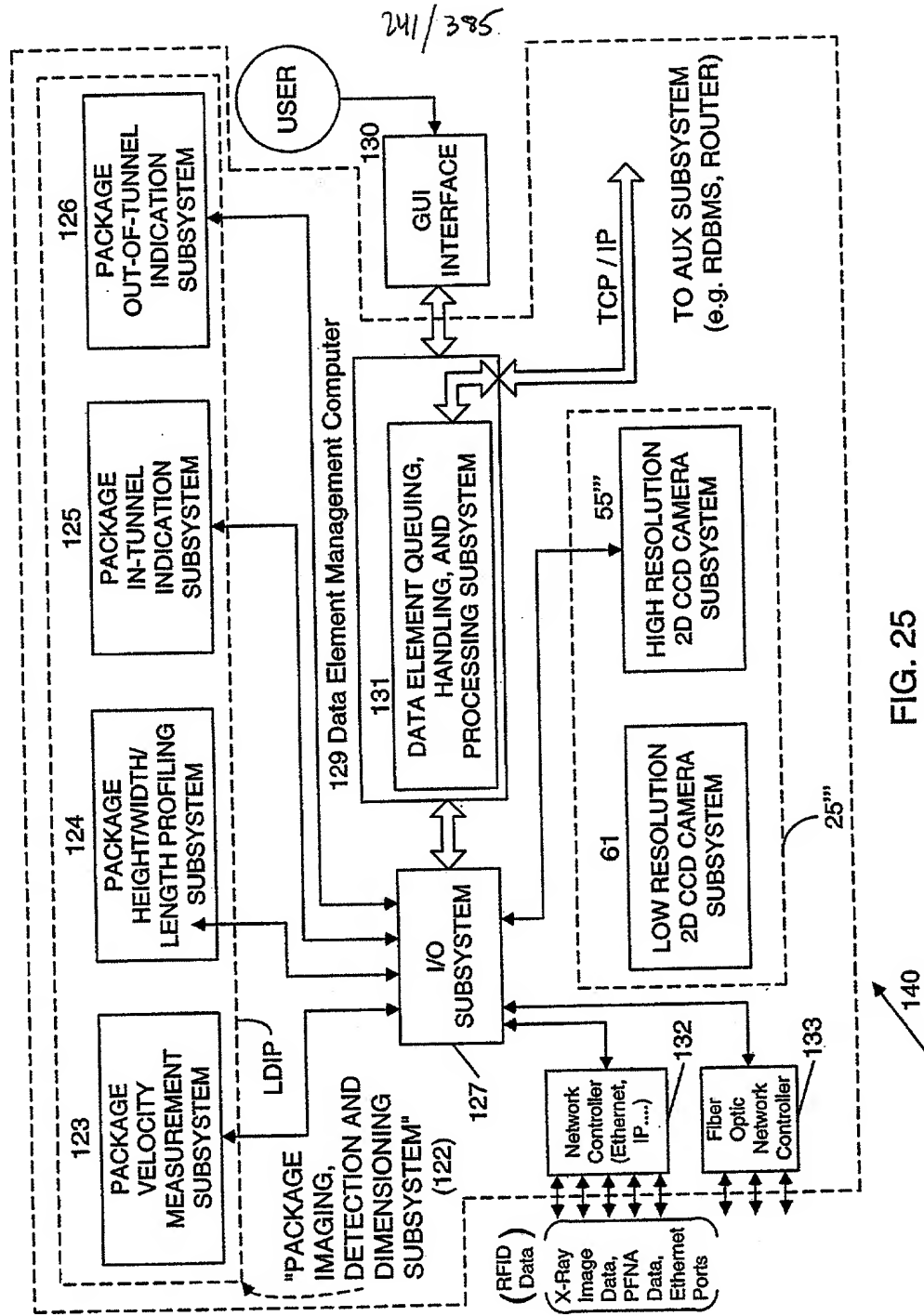


FIG. 25

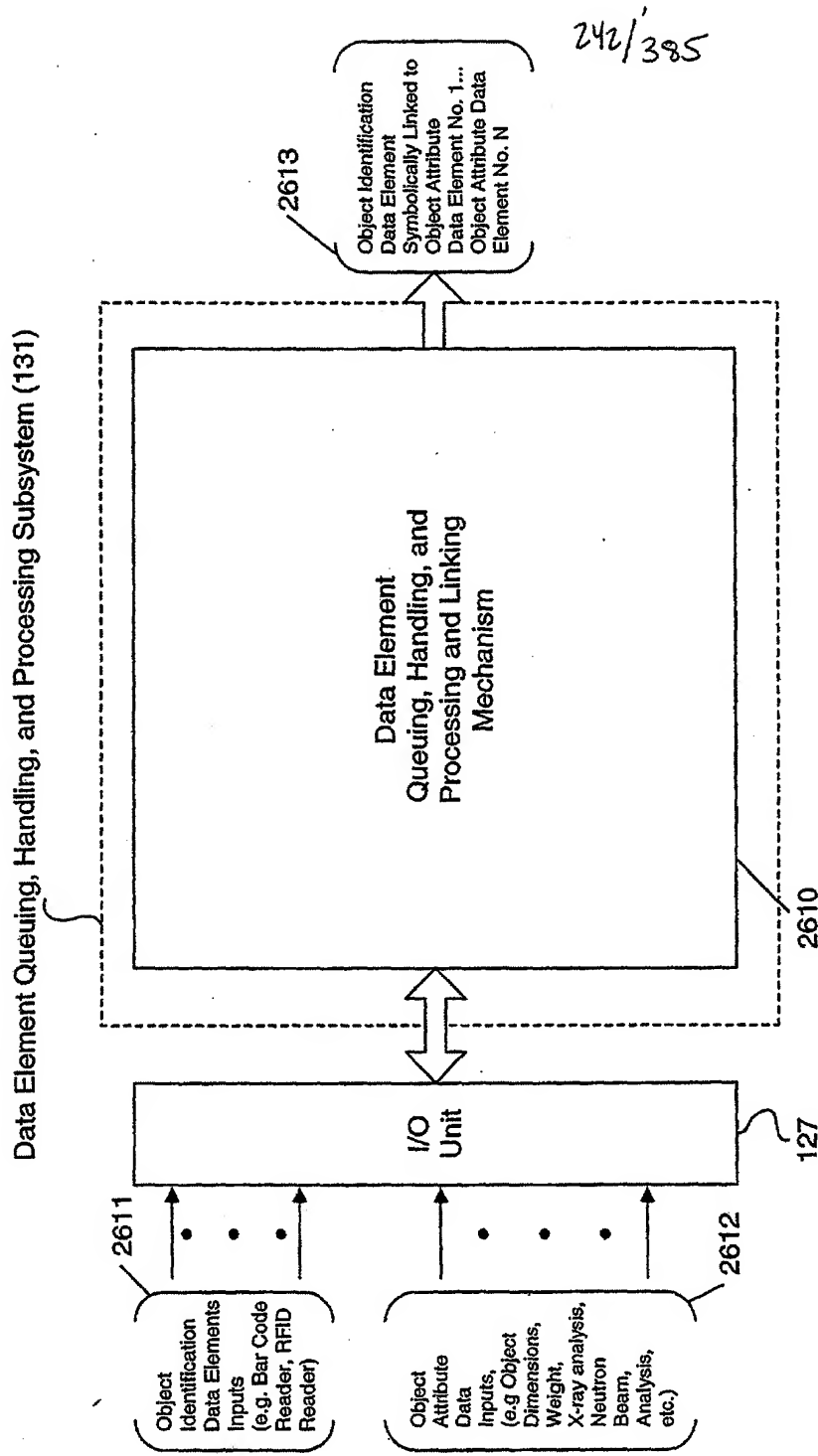


FIG. 25A



243/385

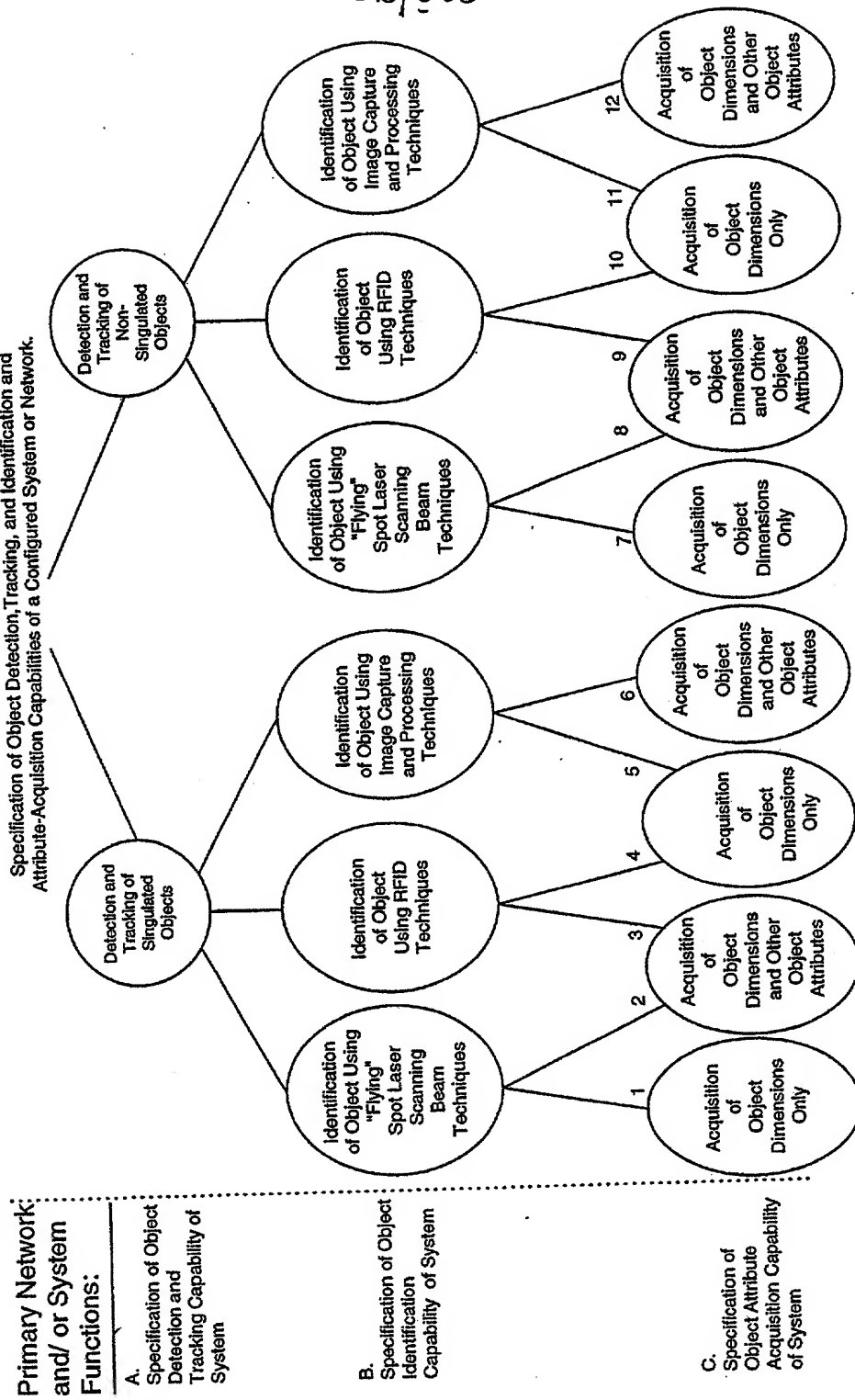


FIG. 25B

244/385

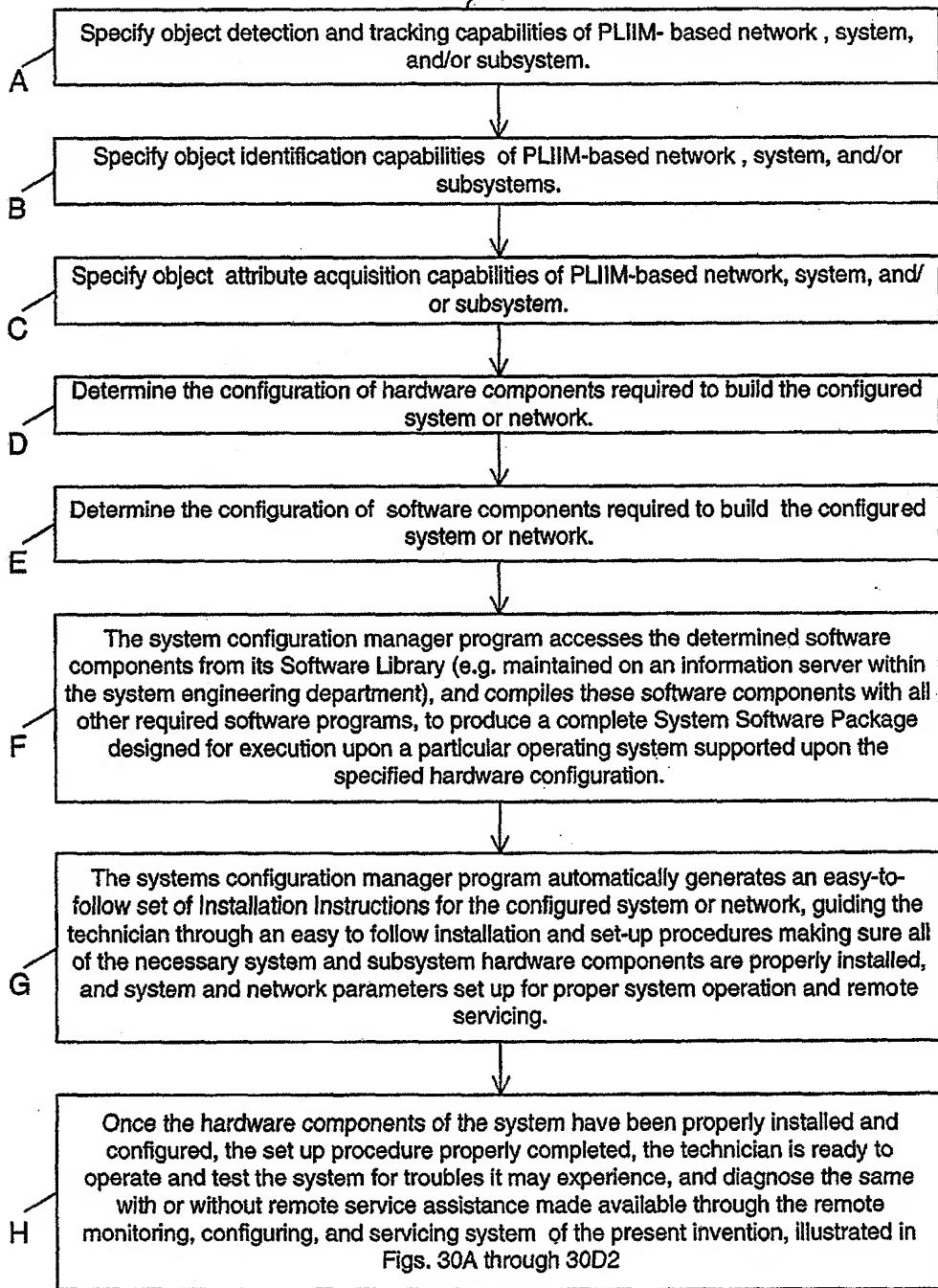


FIG. 25C

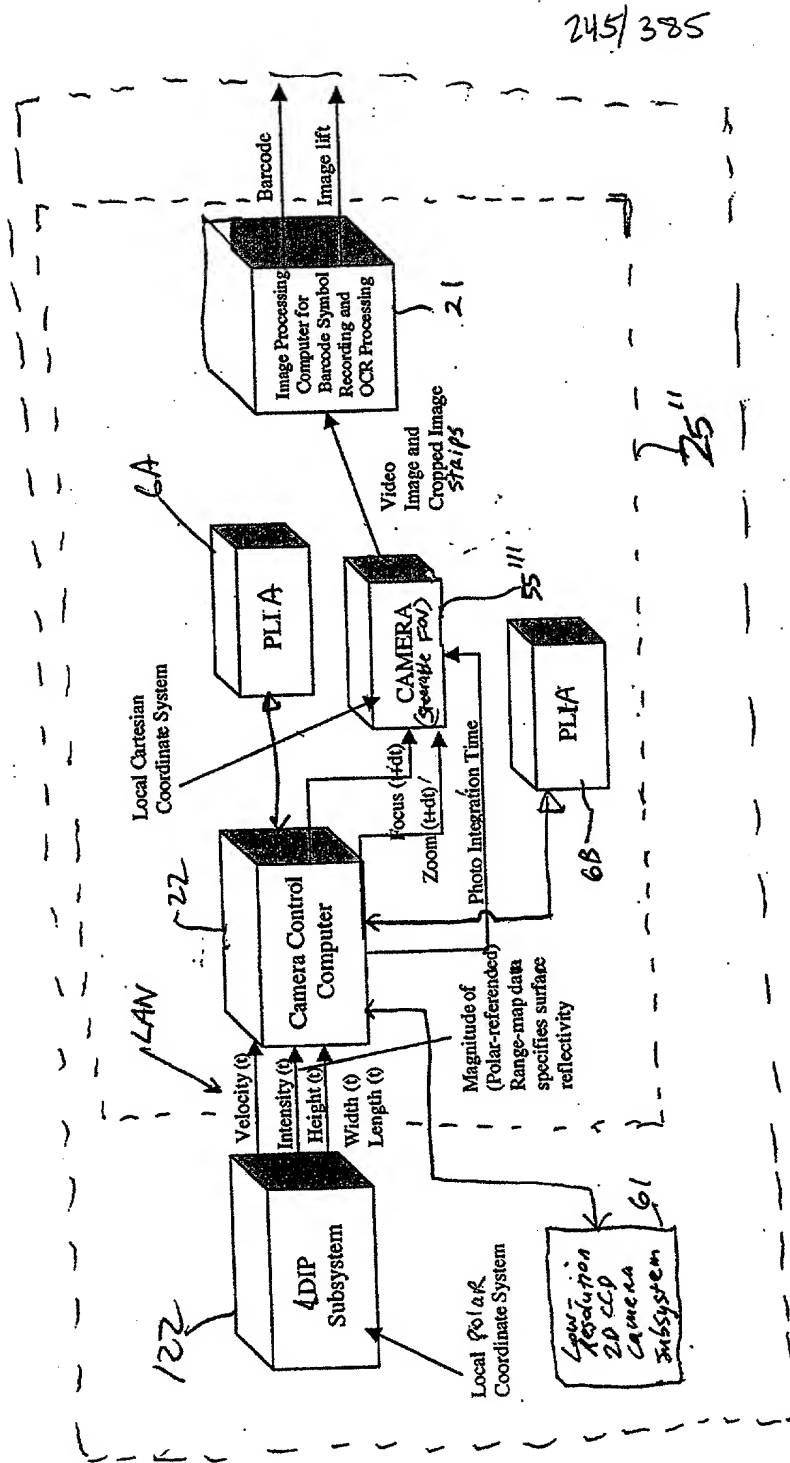
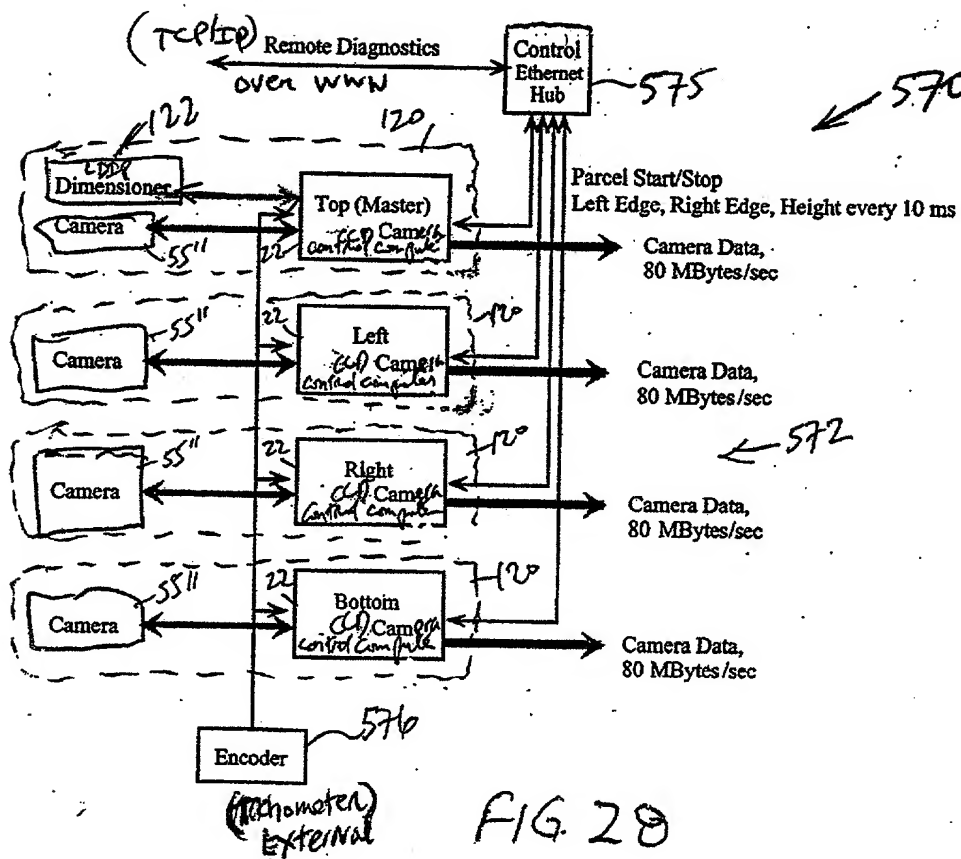
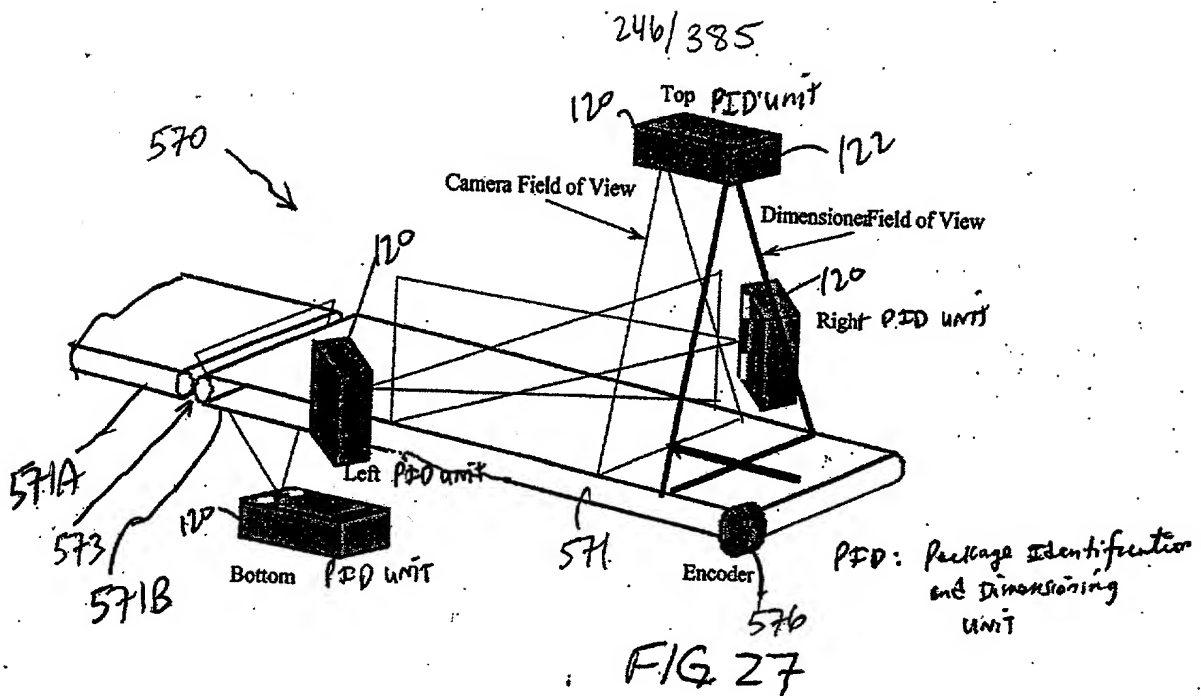


FIG. 26

20220220 234300



20200229485001

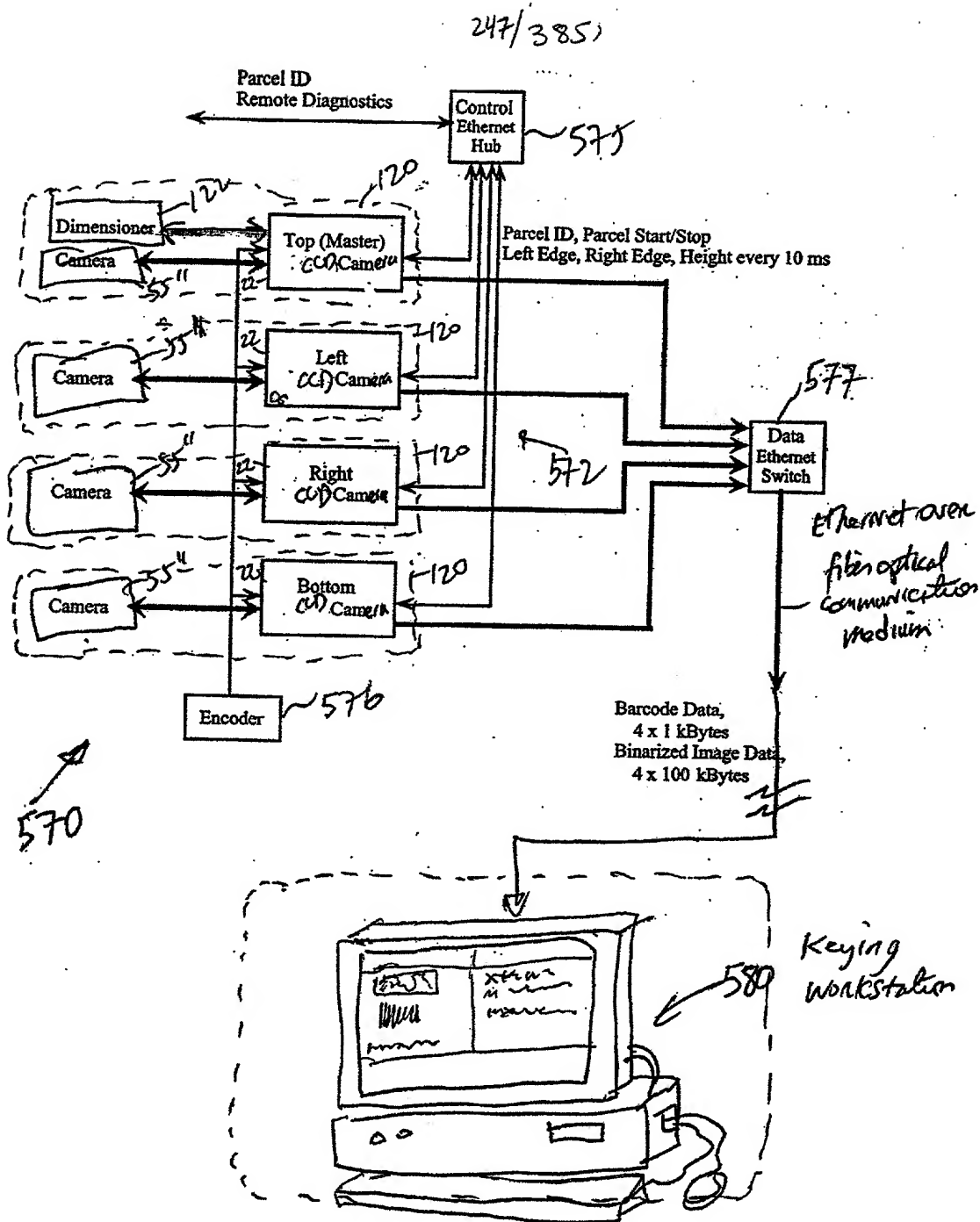
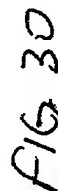
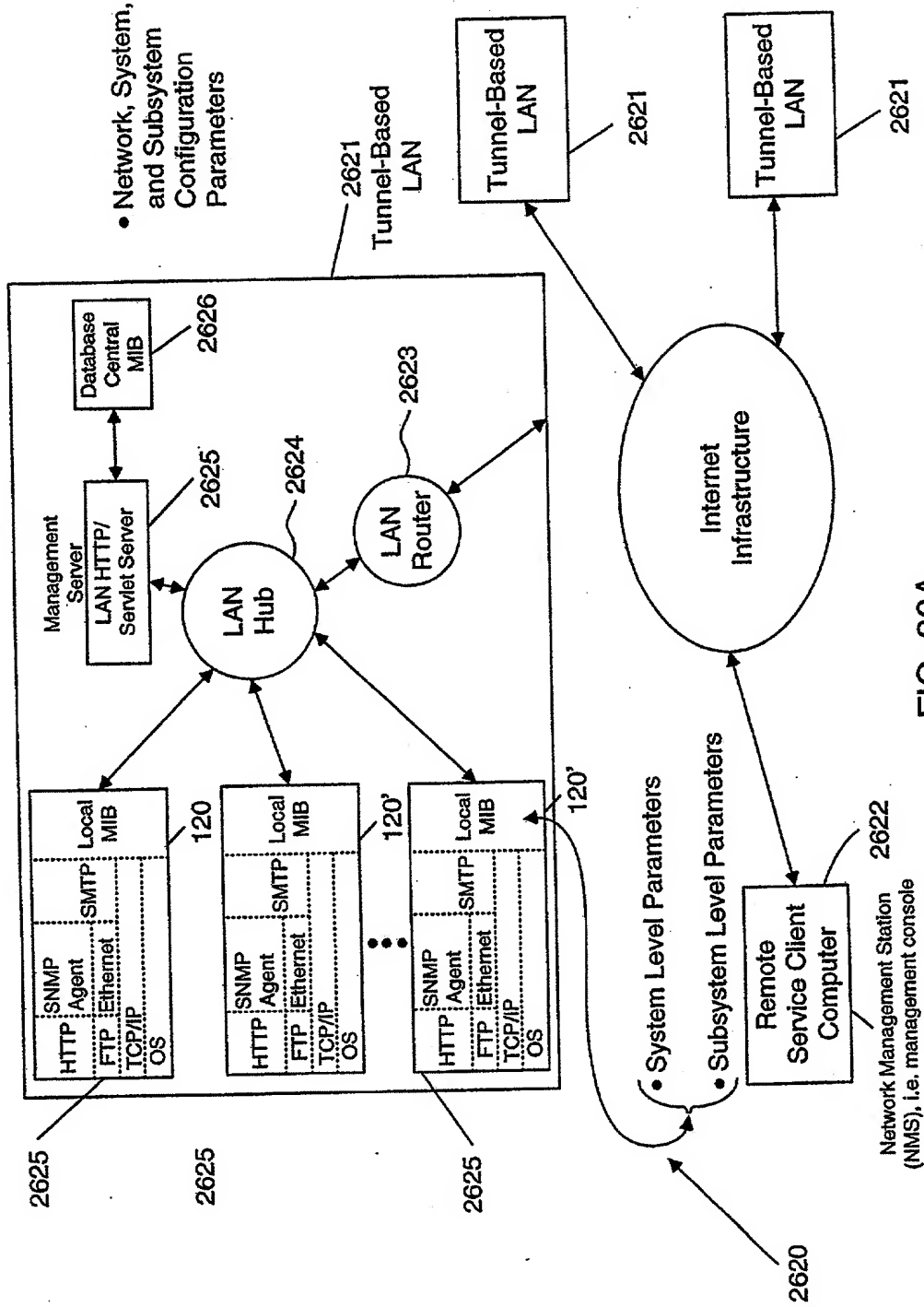
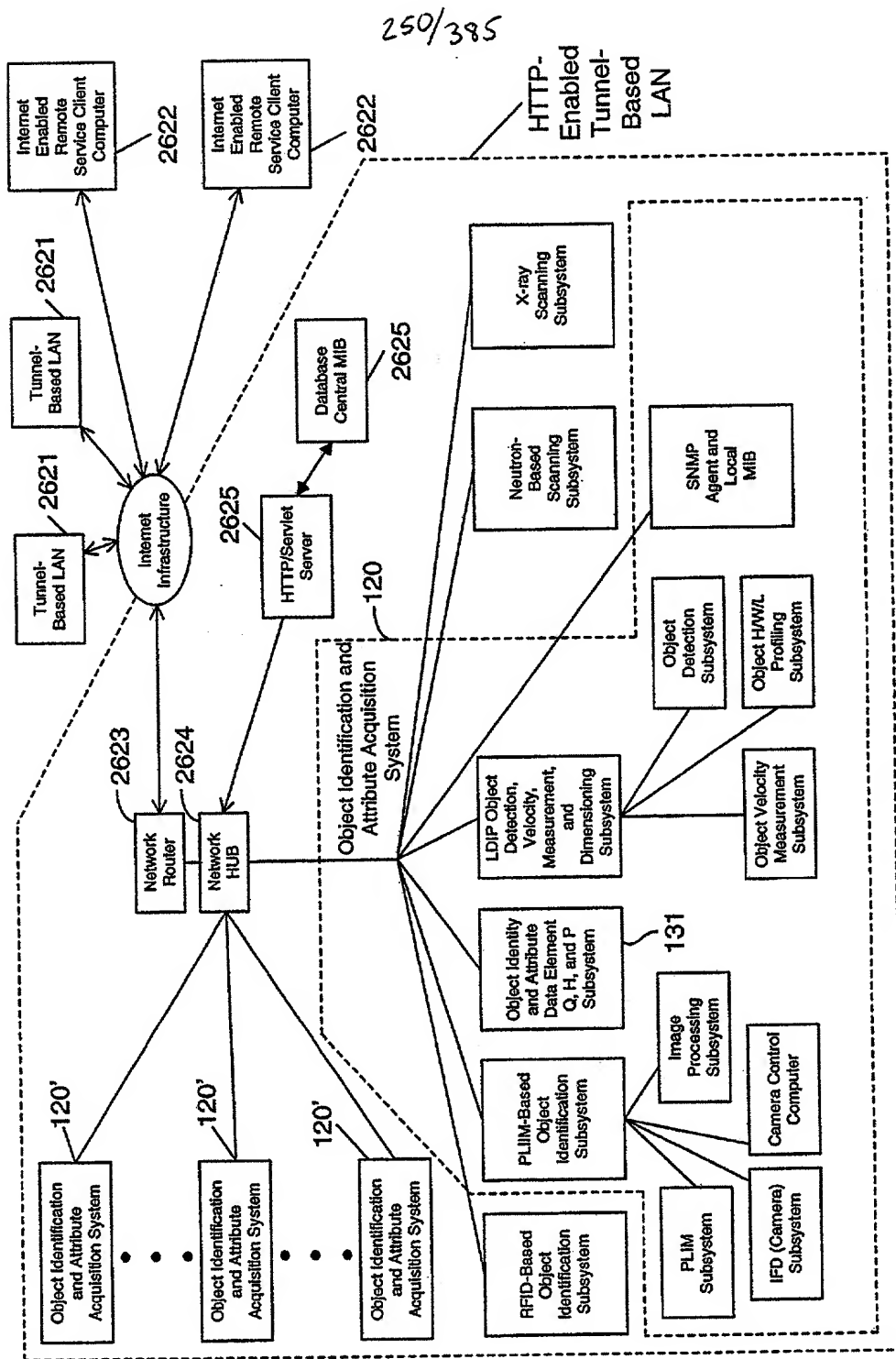


FIG. 29

248/385







**FIG. 30B**



### Network Configuration Parameters:

[ Router IP address; no. of nodes (i.e. systems) in LAN; passwords, LAN location; name of customer facility; technical contact; phone no.; domain name; object identity codes; object attribute acquisition codes;.....]

### System Configuration Parameters:

[ System IP Address; passwords; object identity codes; object attribute acquisition codes;.....]

### Monitorable and/or Configurable Parameters for Subsystems Within Each System:

- |   |   |
|---|---|
| <p>These subsystems generate object identity parameters</p>   | <p><input type="checkbox"/> PLIIM-based object identification subsystem: [ object identity code; object attribute acquisition codes;.....]</p> <p><input type="checkbox"/> PLIM Subsystem: [VLD status; power VLD; TIM function; temp;.....]</p> <p><input type="checkbox"/> IFD ( Camera) Subsystem: [sensor temp; .....]</p> <p><input type="checkbox"/> Image Processing Subsystem (Computer): [processor load history; system up time; # of frames (pgs); barcode read rate; current line rate;.....]</p> <p><input type="checkbox"/> Camera Contact Subsystem (Computer): [number of frames dropped; number of focused zoom commands; number and kinds of motor control errors;.....]</p>                                |
| <p>This system links object attribute data element parameters (i.e. object identity to data element) to corresponding object identity parameters (i.e. object attribute data element)</p> | <p><input type="checkbox"/> RFID-based object identification subsystem: [....]</p> <p><input type="checkbox"/> Object identity and attribute data element queuing, handling and processing subsystem: [....]</p> <p><input type="checkbox"/> LDIP object identification, velocity-measurement, and dimensioning subsystem: [....]</p> <p><input type="checkbox"/> Object velocity measurement subsystem: [polygon RPM; polygon laser output X; channel X drift; channel X noise; trigger error events; instant lock reference drift; temperature]</p> <p><input type="checkbox"/> Object H/W/L profiling subsystem</p> <p><input type="checkbox"/> Object detection subsystem: [non- singulation/ singulation code;.....]</p> |
| <p>These subsystems generate object attribute parameters</p>  | <p><input type="checkbox"/> X-ray scanning subsystem: [....]</p> <p><input type="checkbox"/> Neutron-beam scanning subsystem: [....]</p>  |

FIG. 30C

252/385

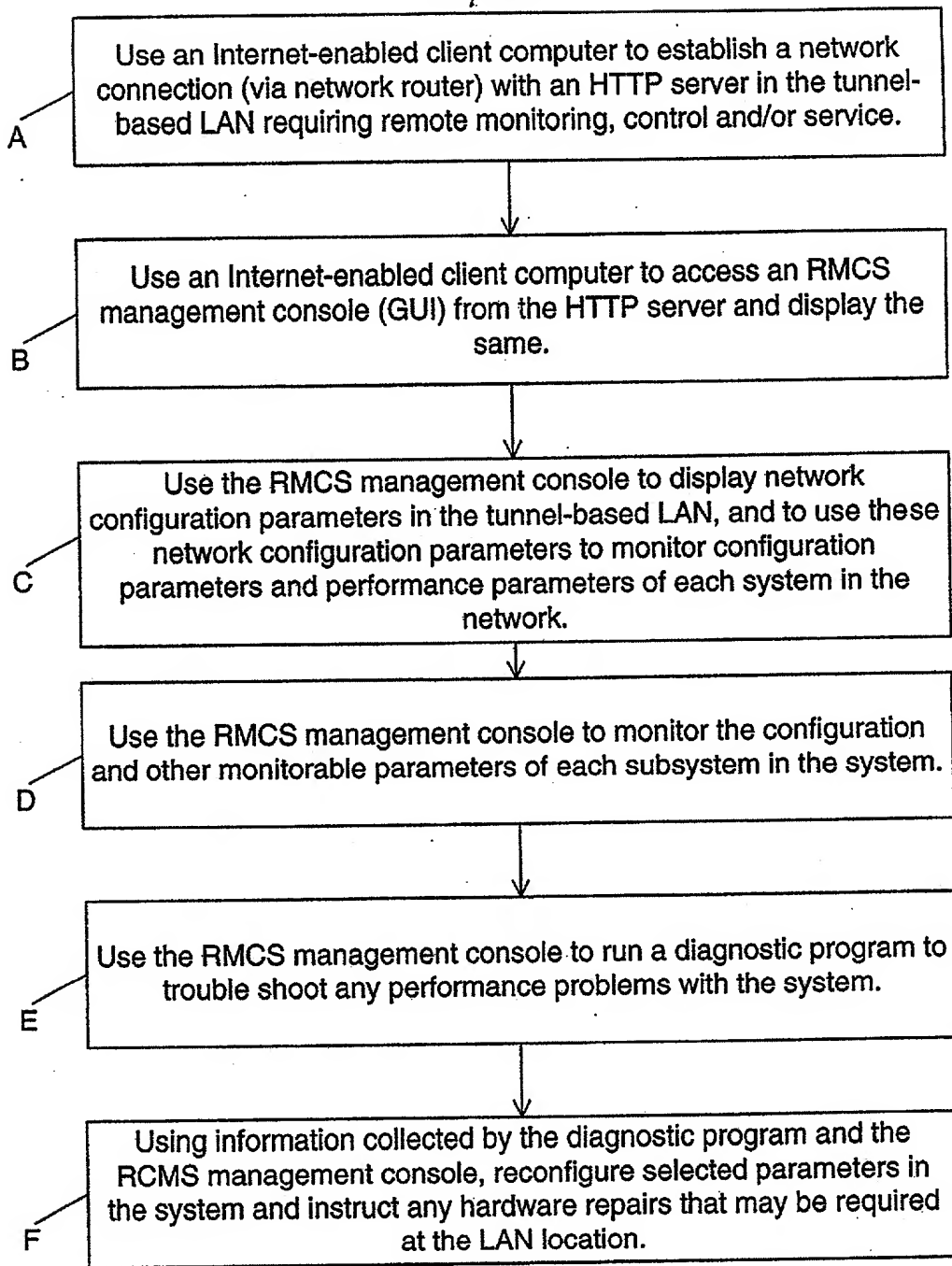


FIG. 30D1

253/385 (A)

G

Use the RMCS management console to rerun diagnostic programs on troubled systems and subsystems in the LAN after parameter reconfiguration and/or hardware repair at the LAN location, so as to test the performance of such systems and subsystems and the overall tunnel based LAN.

H

Use the RMCS management console to monitor parameters of the system and subsystems in the tunnel based LAN, from time to time, to determine whether or not the system and/or network tunnel is required.

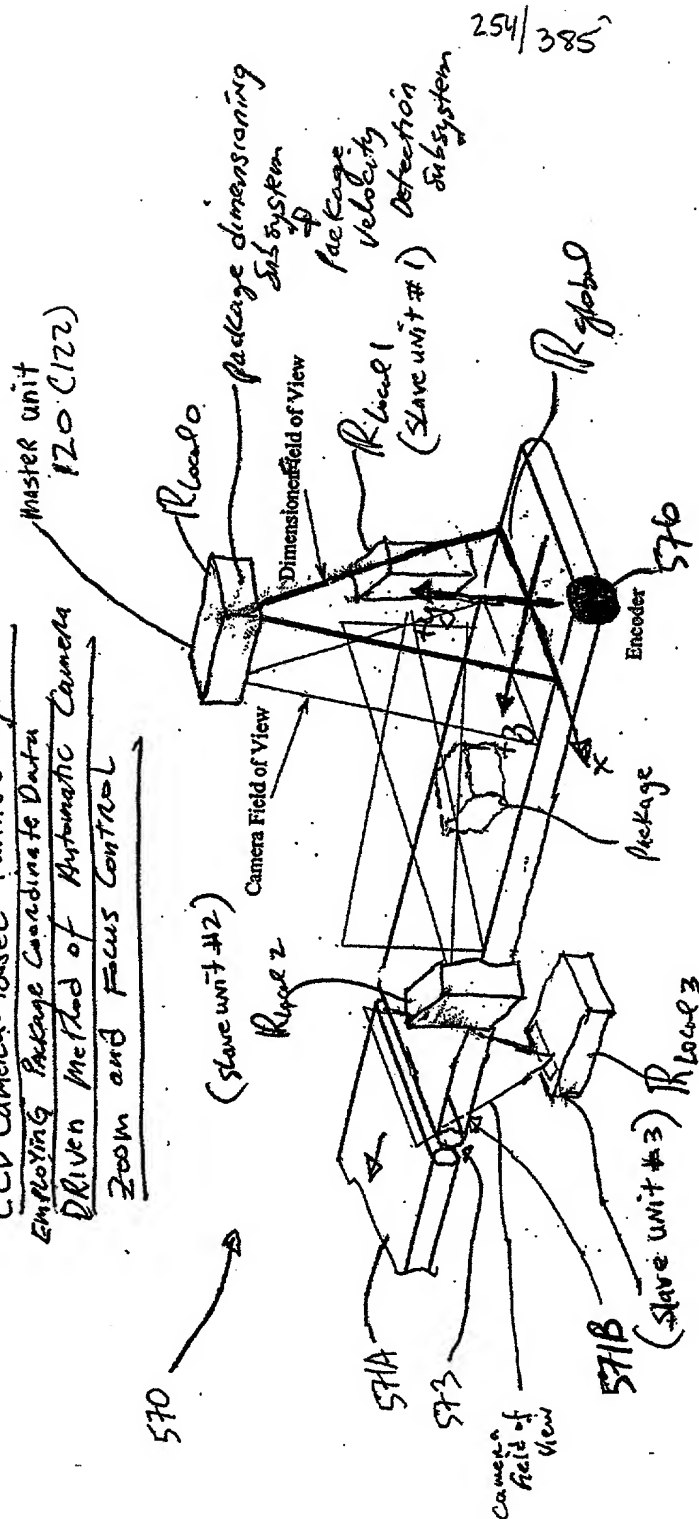
I

Use the RMCS management console to record all monitored parameter records and result of diagnostic programs in a customer service database for future reference, and access during subsequent remote service calls over the Internet.

FIG. 30D2

[illegible]

# CCD Camera-Based Tunnel System Employing Package Coordinate Data Driven Method of Automatic Camera Zoom and Focus Control



Package coordinate data  $\xrightarrow[\text{Regional}]{\text{Hq}}$  Package coordinate data  $\parallel R_{\text{Local}}$

FIG. 31

255/385

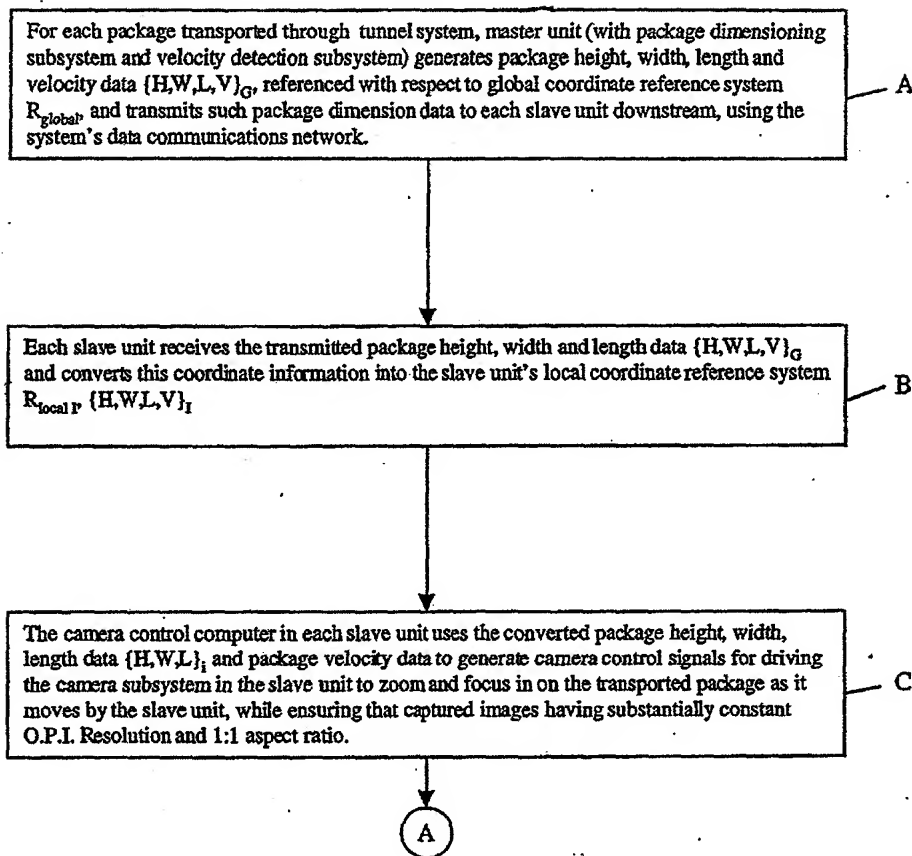


FIG. 32A

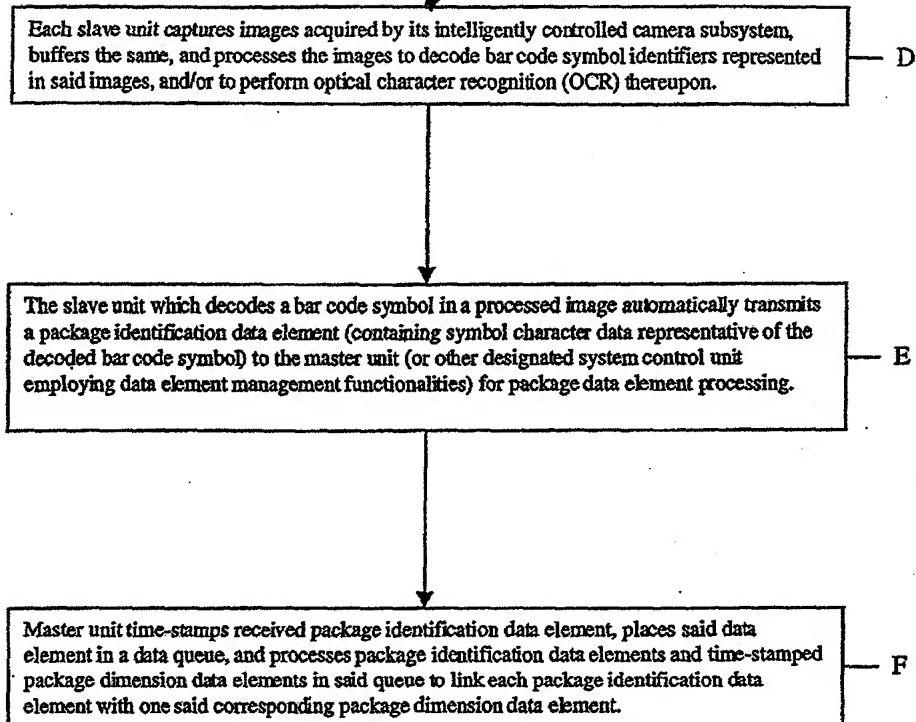


FIG. 32B

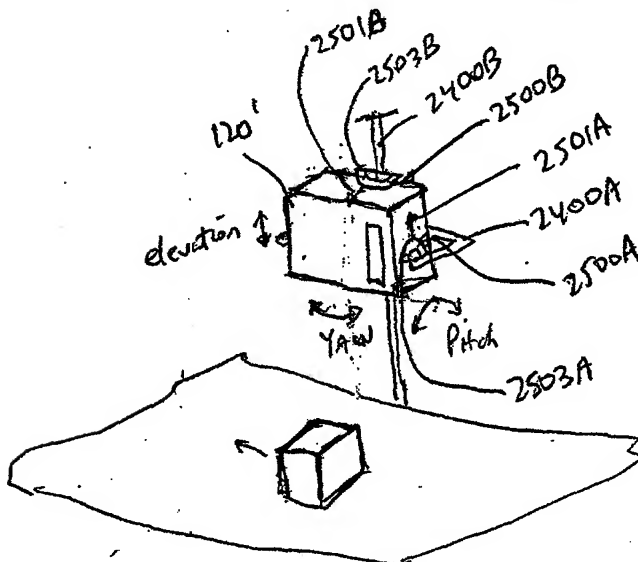


FIG. 31A

257/385

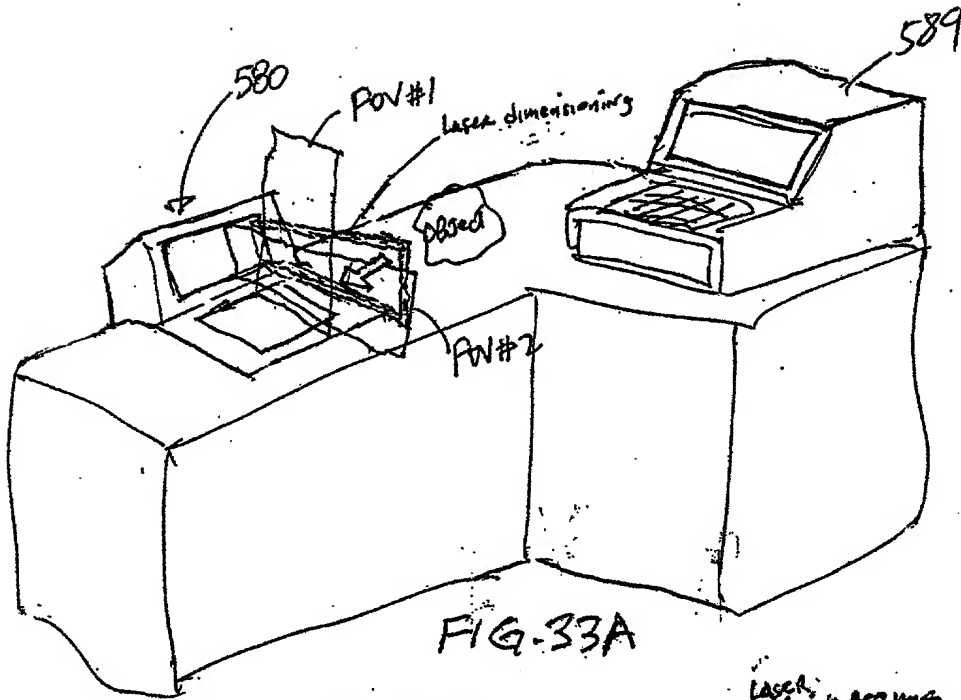


FIG. 33A

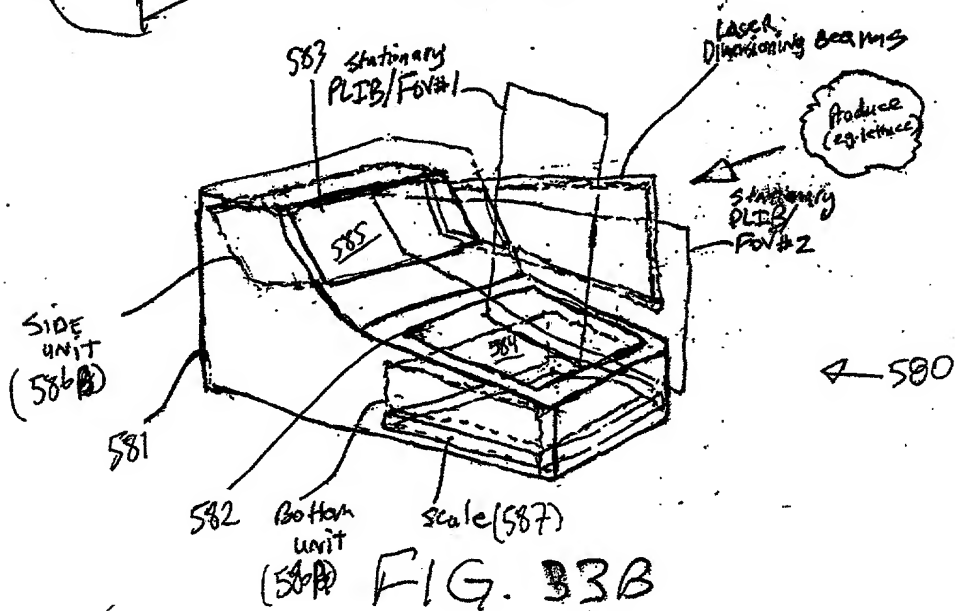


FIG. 33B

10058462, 020702

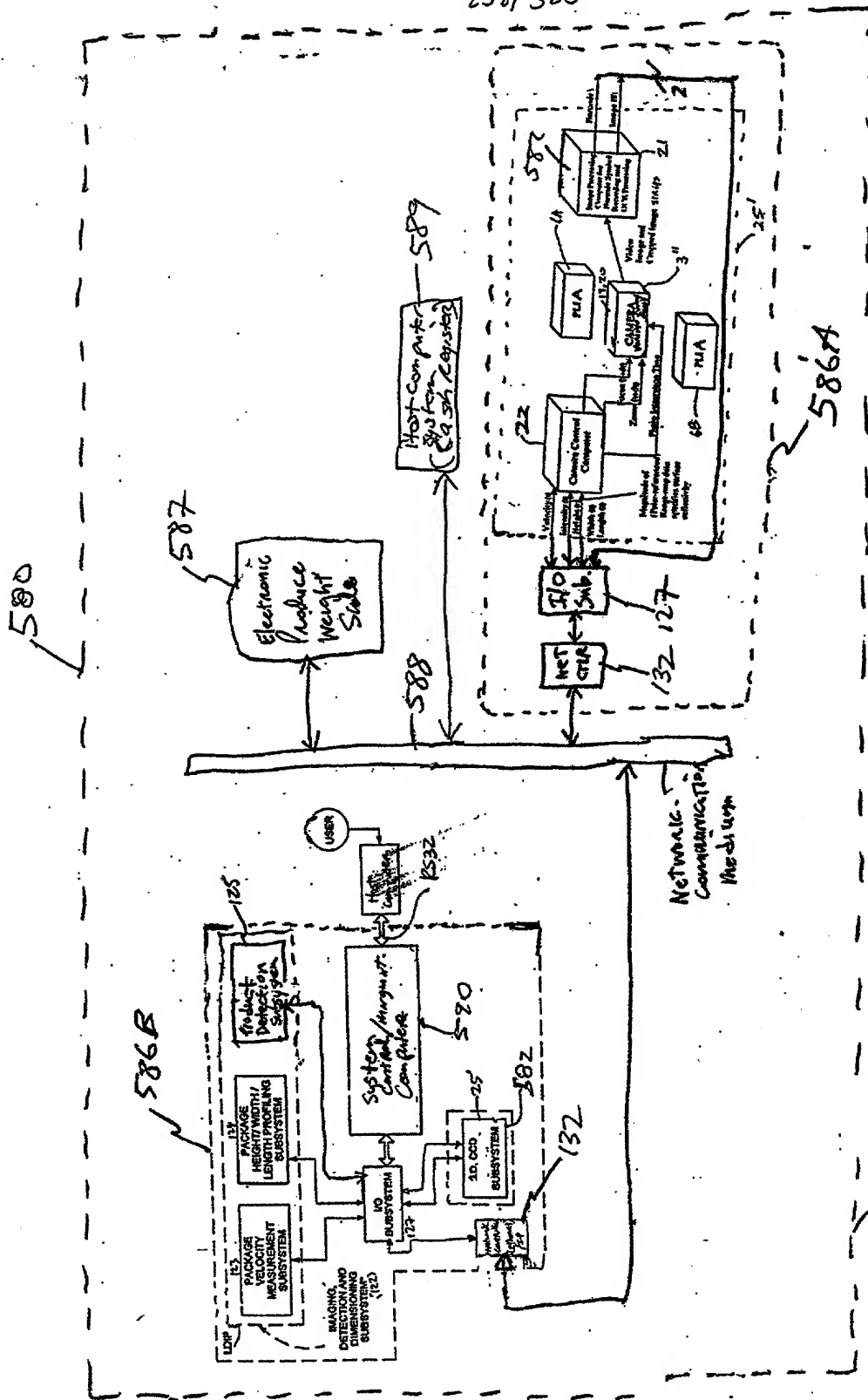


FIG. 33C



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259/385

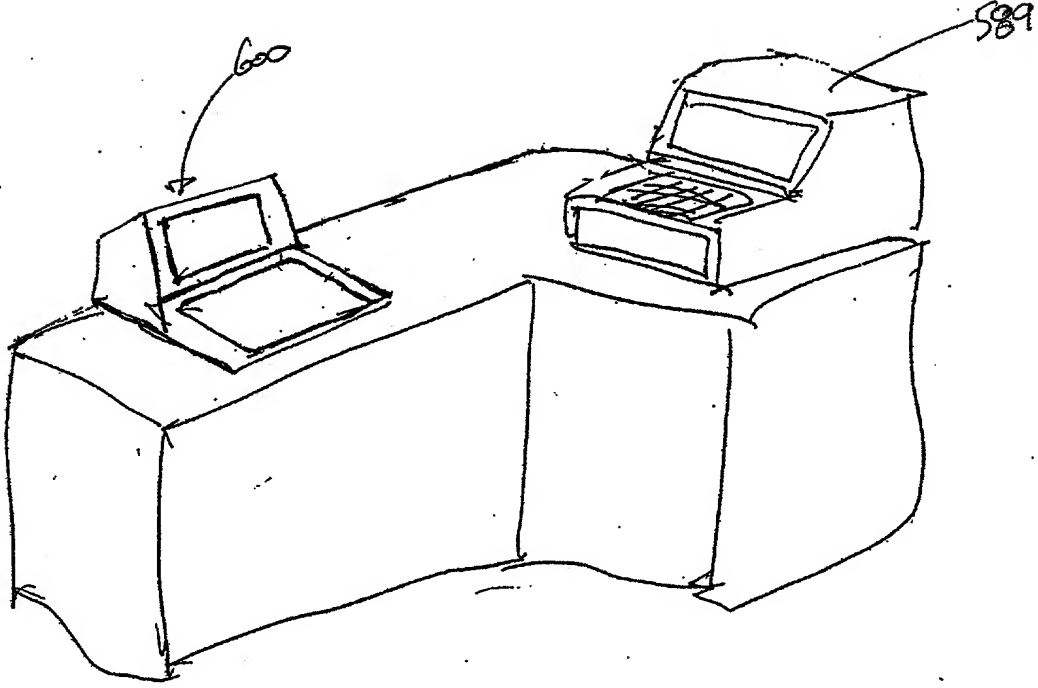


FIG. 34A

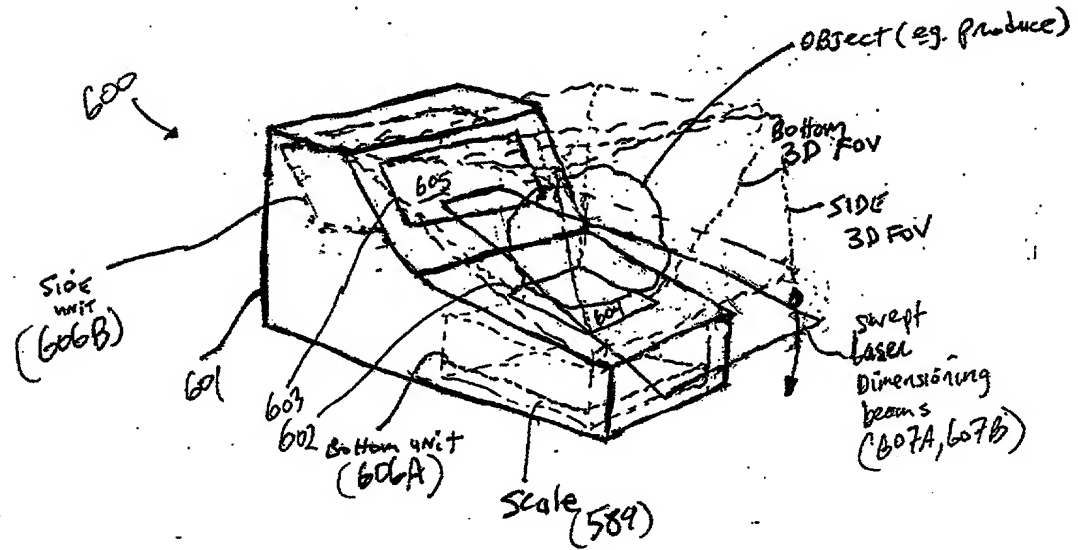
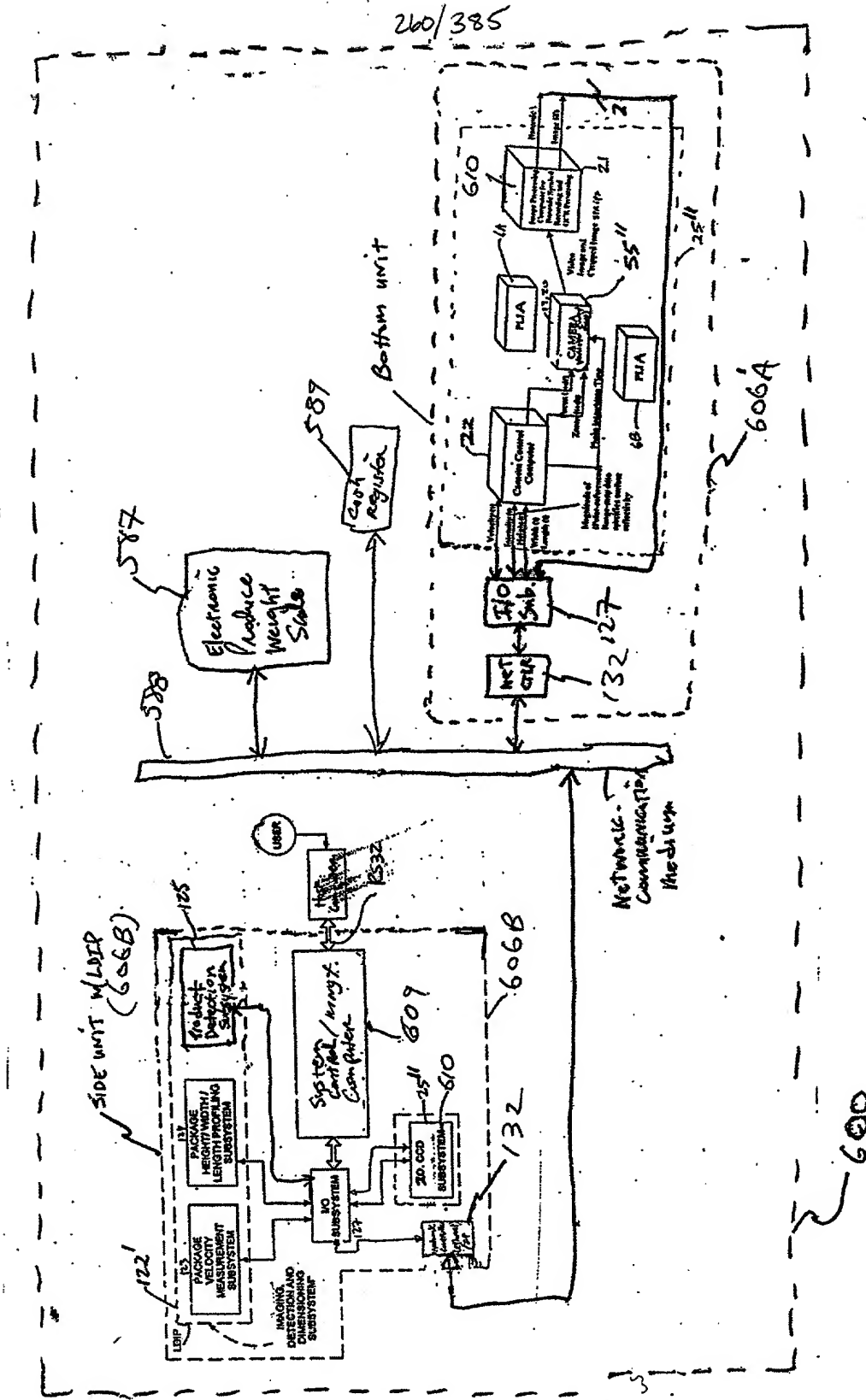
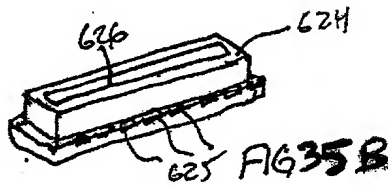
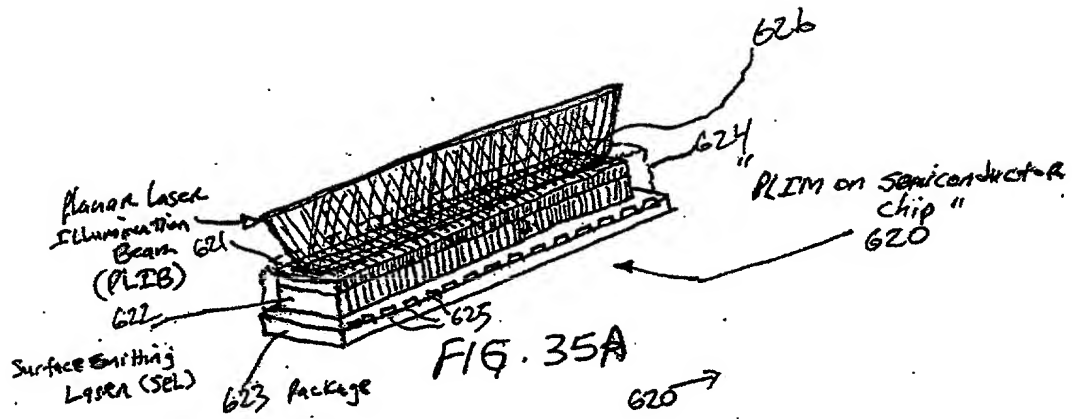


FIG. 34B



261/385



1006492.000702





20200202 29489001

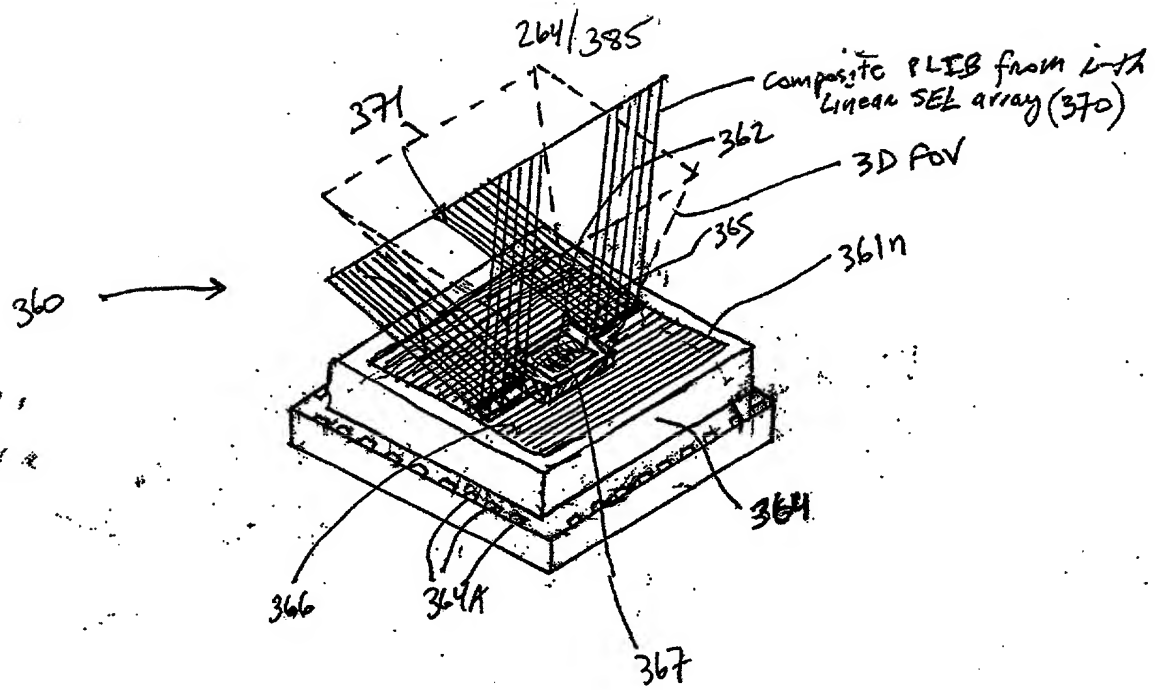


FIG. 38A

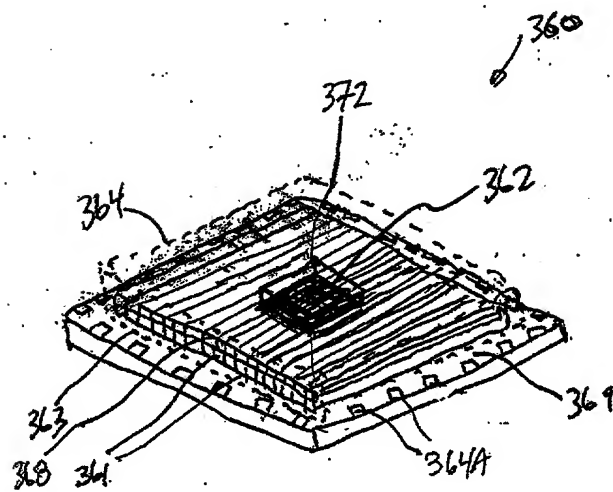


FIG. 38B

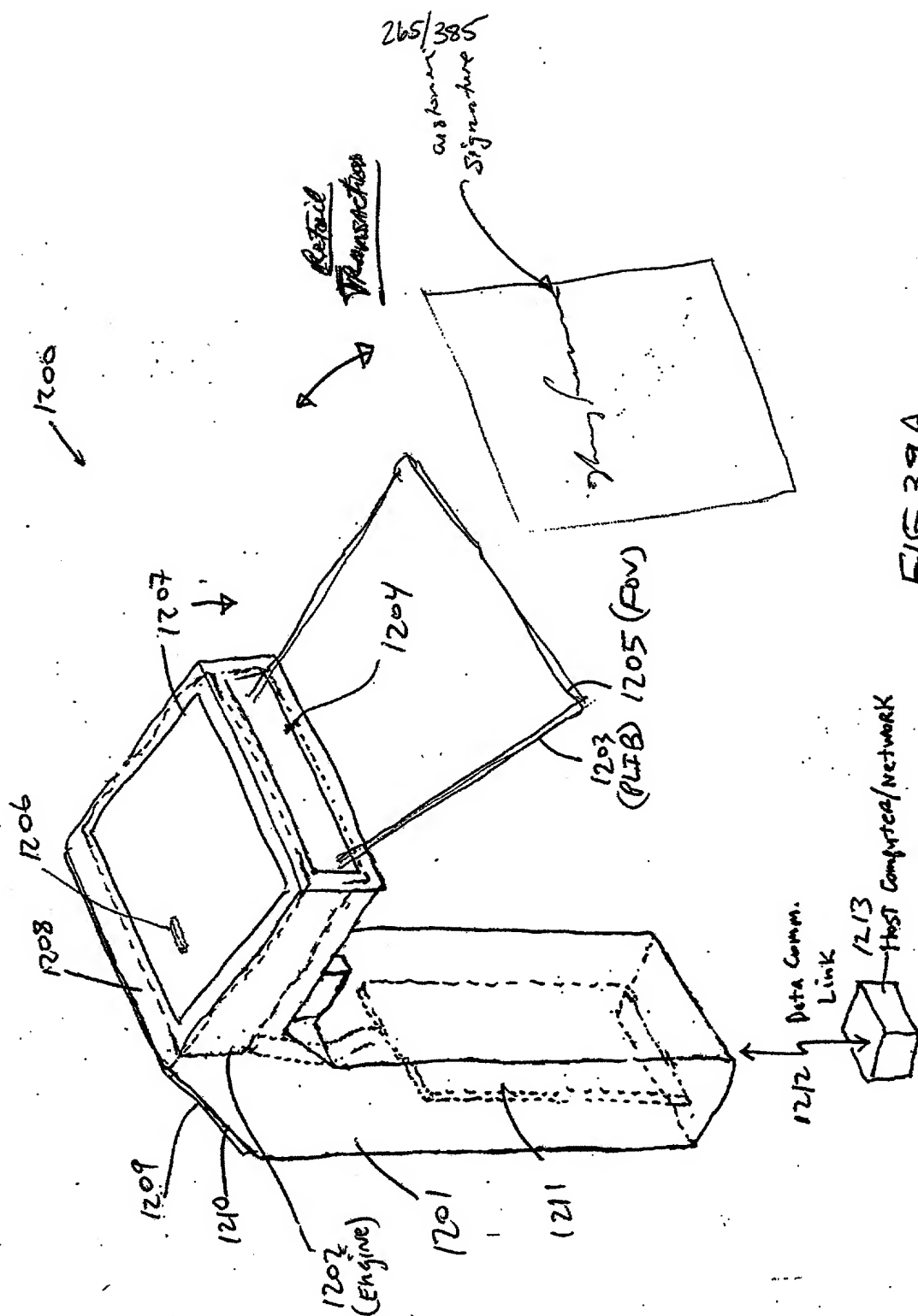


FIG. 39A

202020 25489001

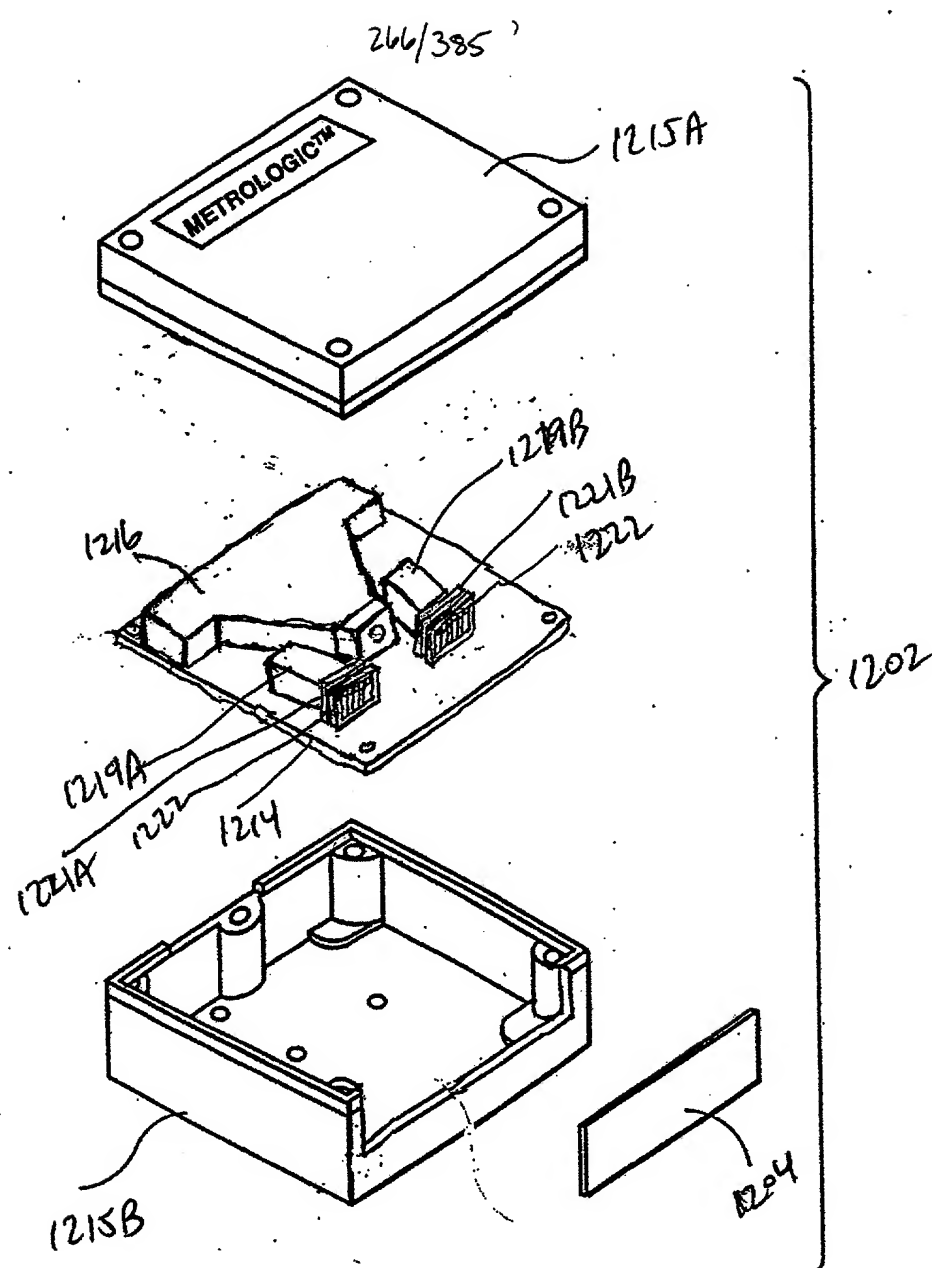


FIG. 39B



20200201 29489001 1005452.020702

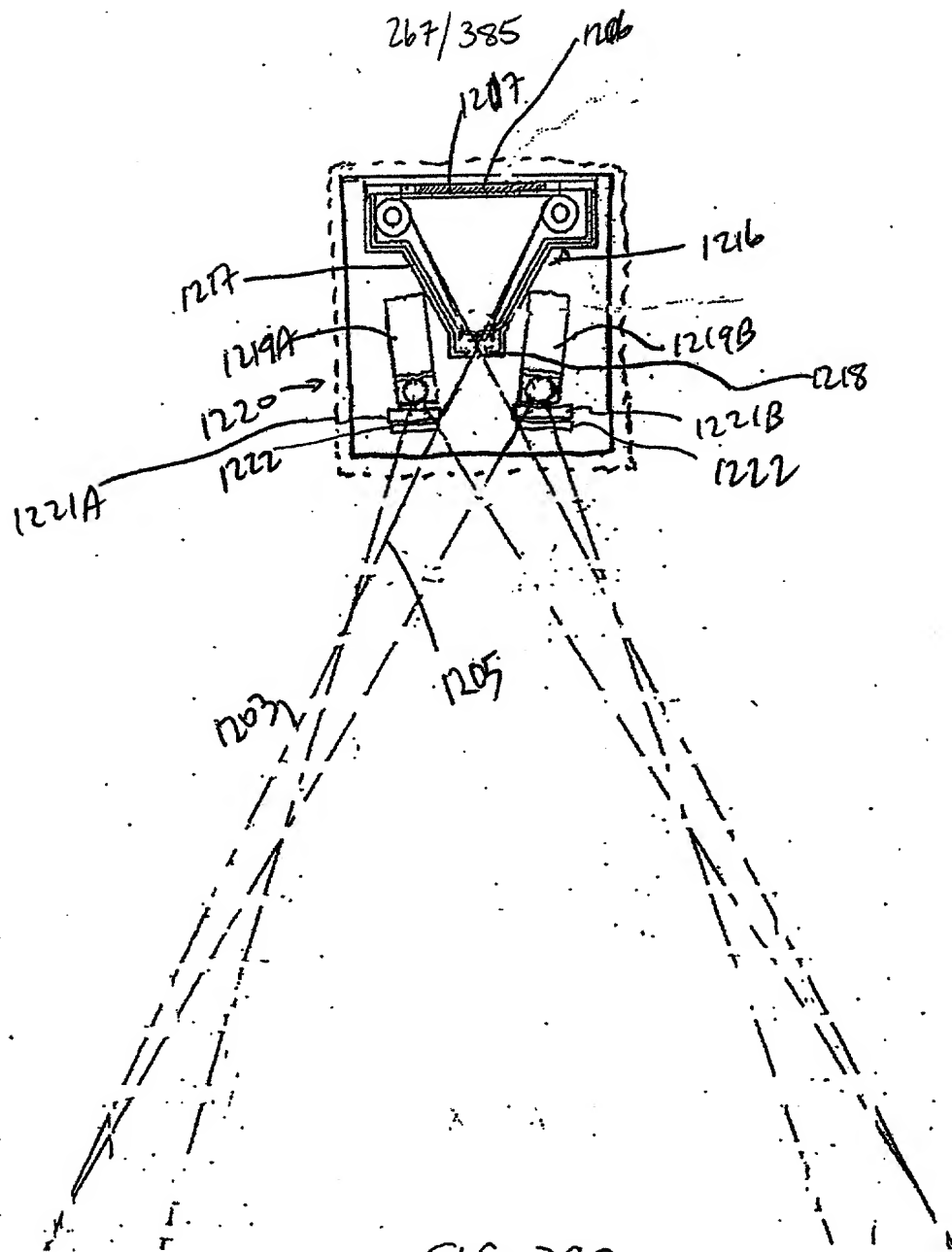


FIG. 39C

268/385

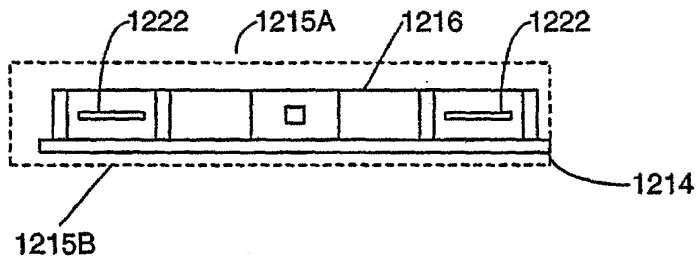


FIG. 39D

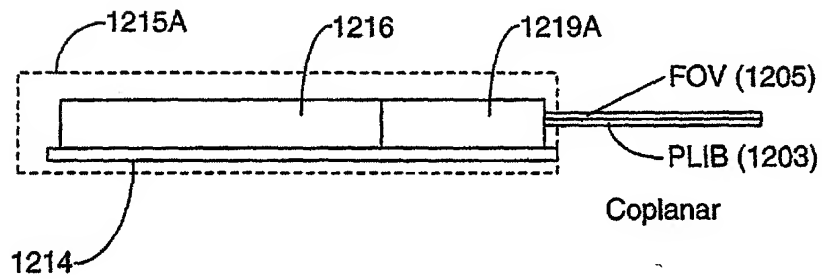


FIG. 39E

1006452.020702

269/385

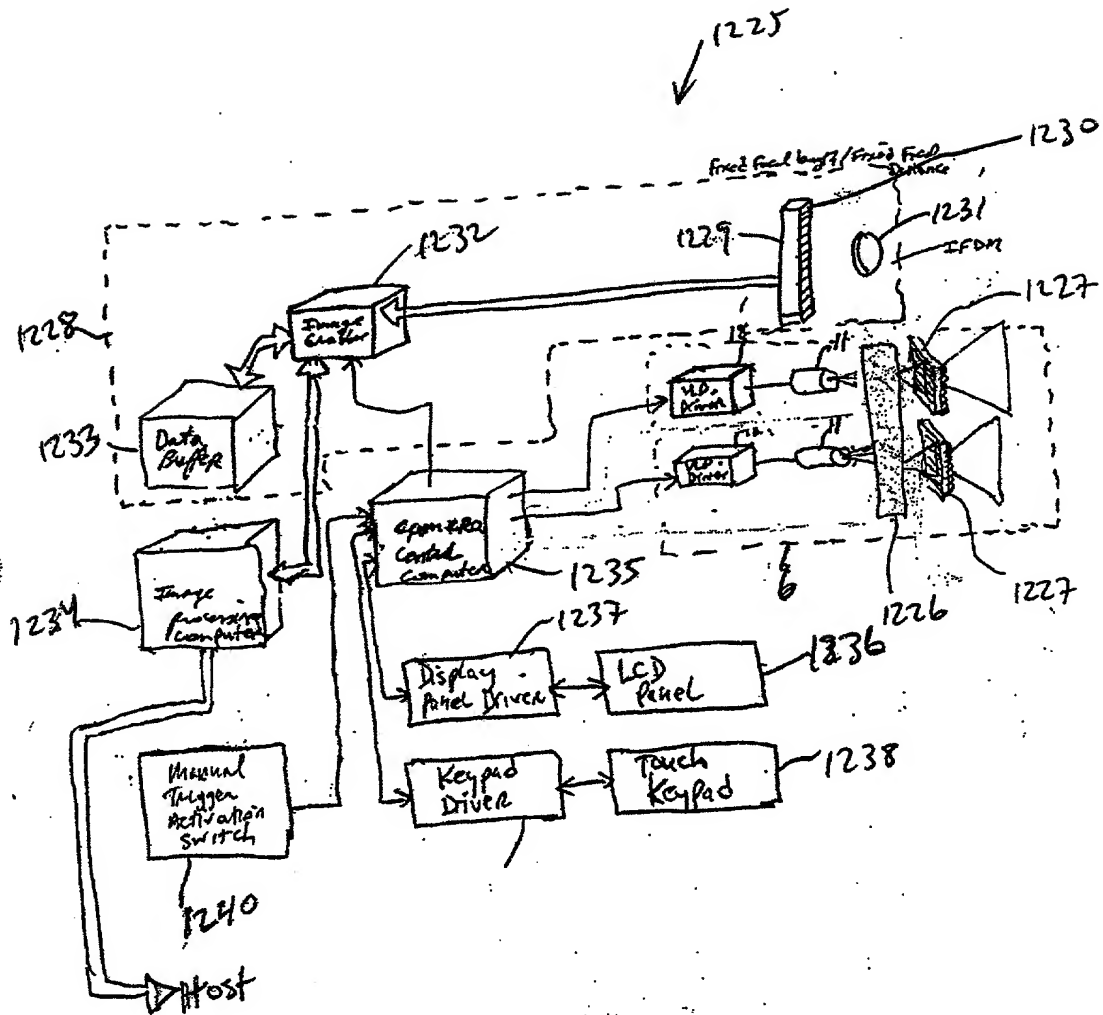
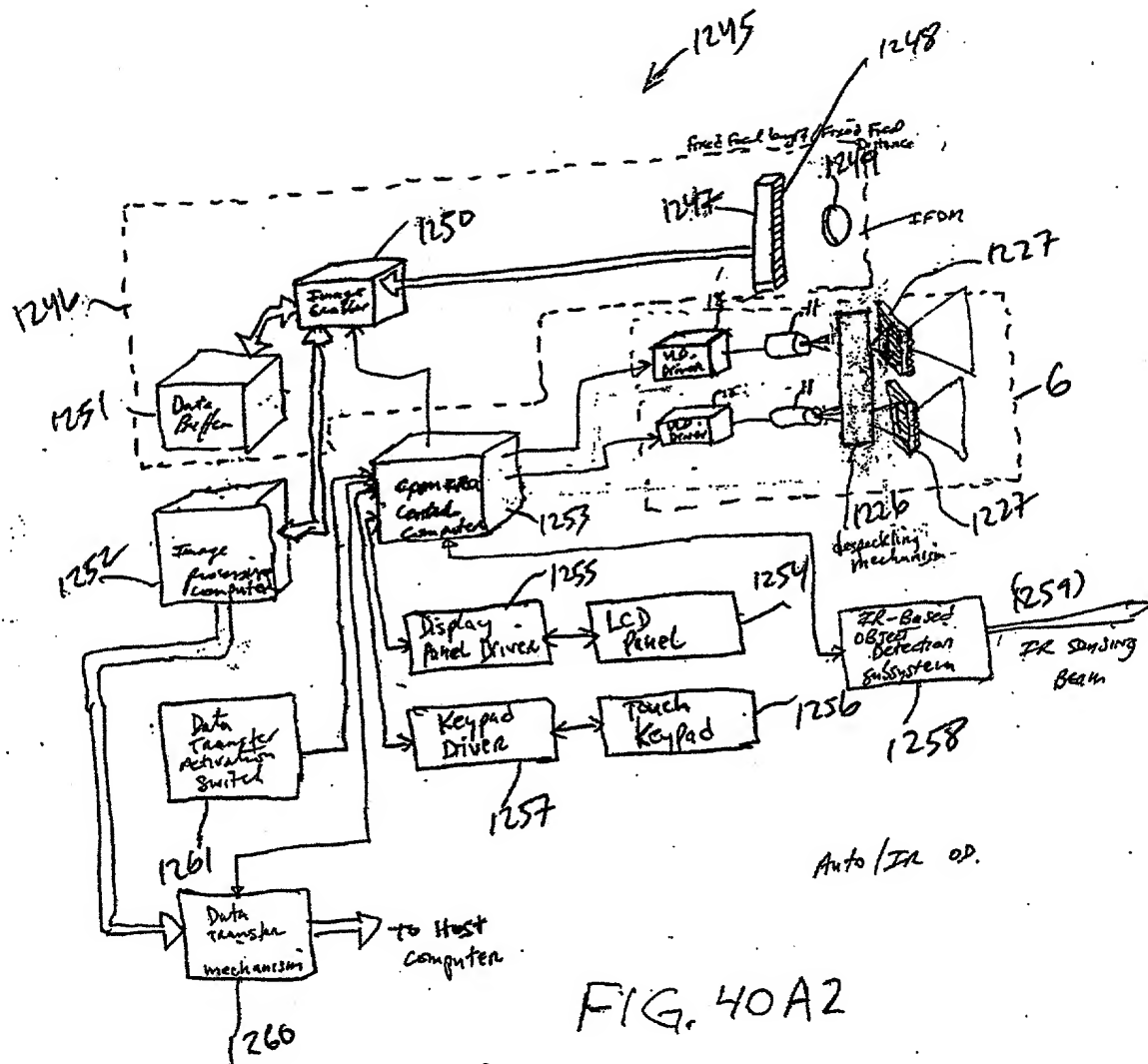
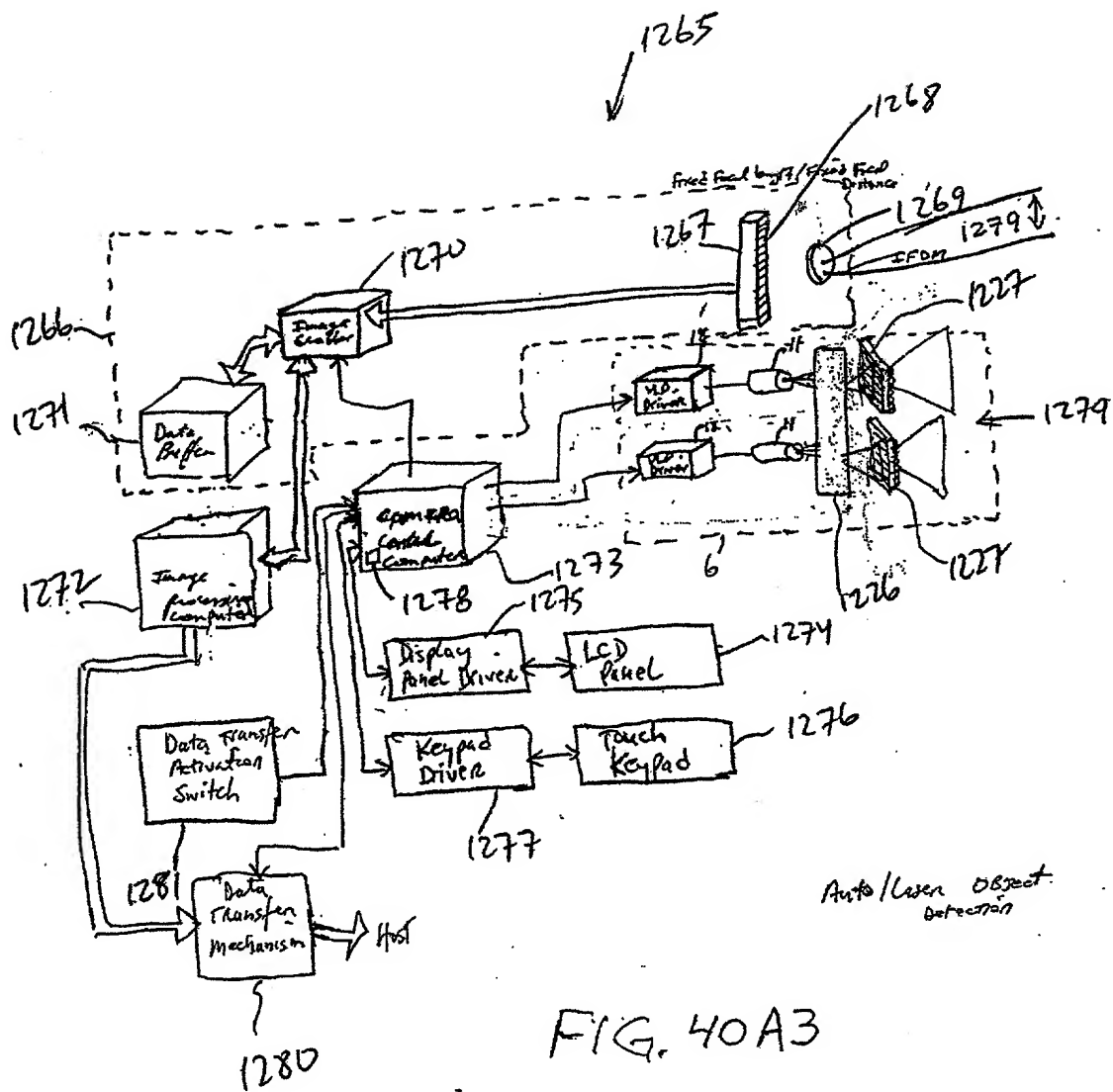


FIG. 40A1

1006462.020702

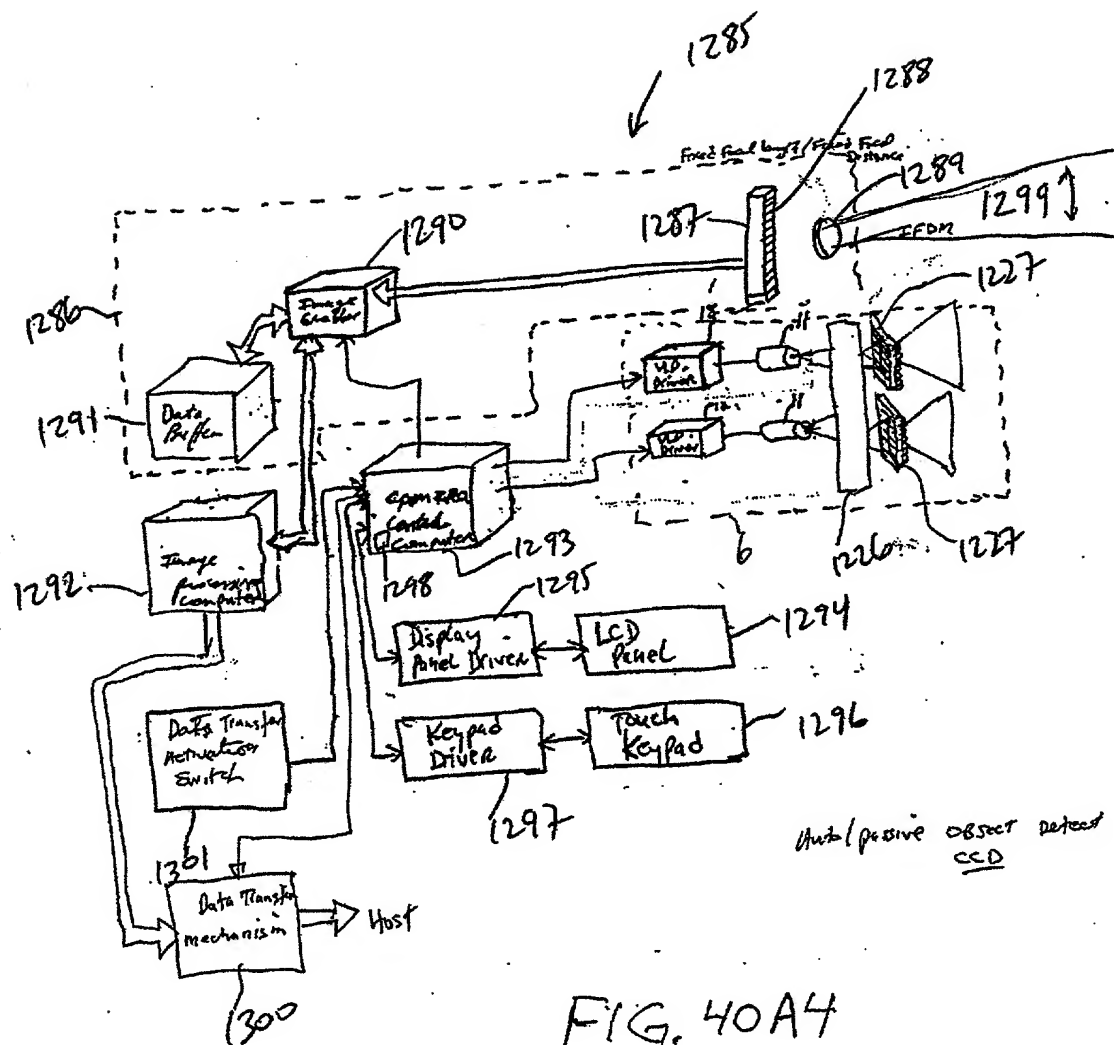
[illegible]

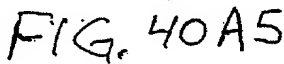
271/385



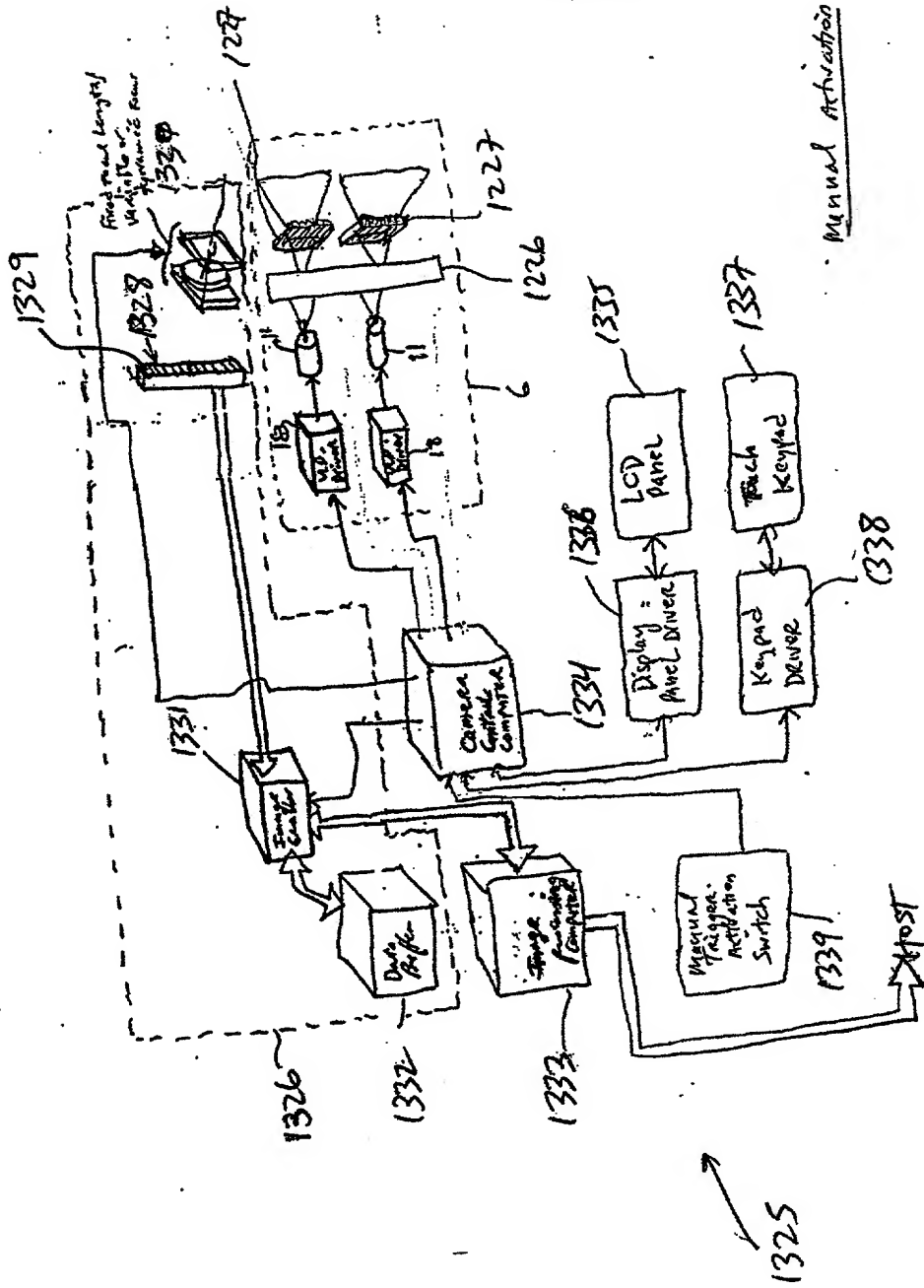
10068462.020702

272/385





274/385





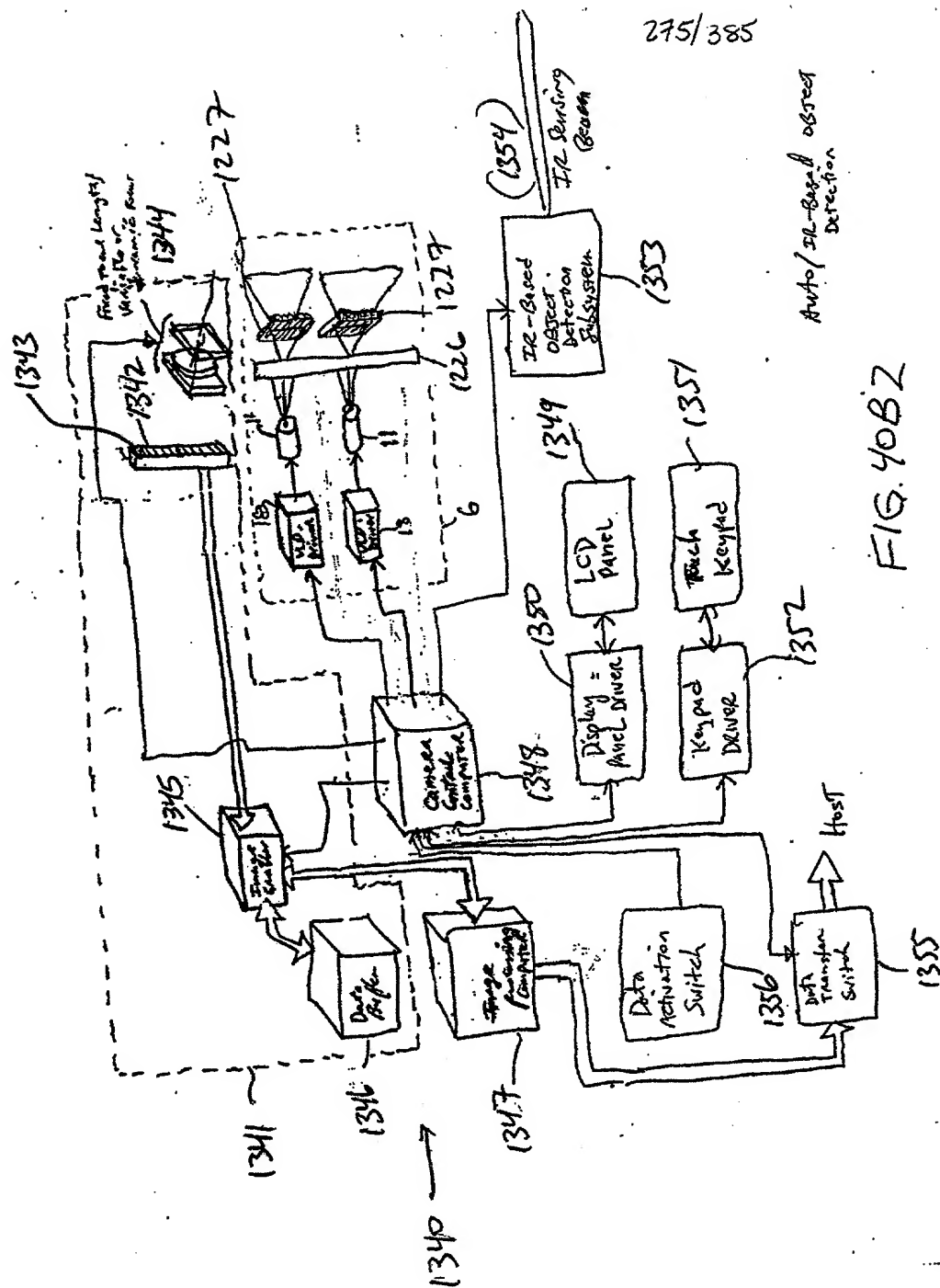
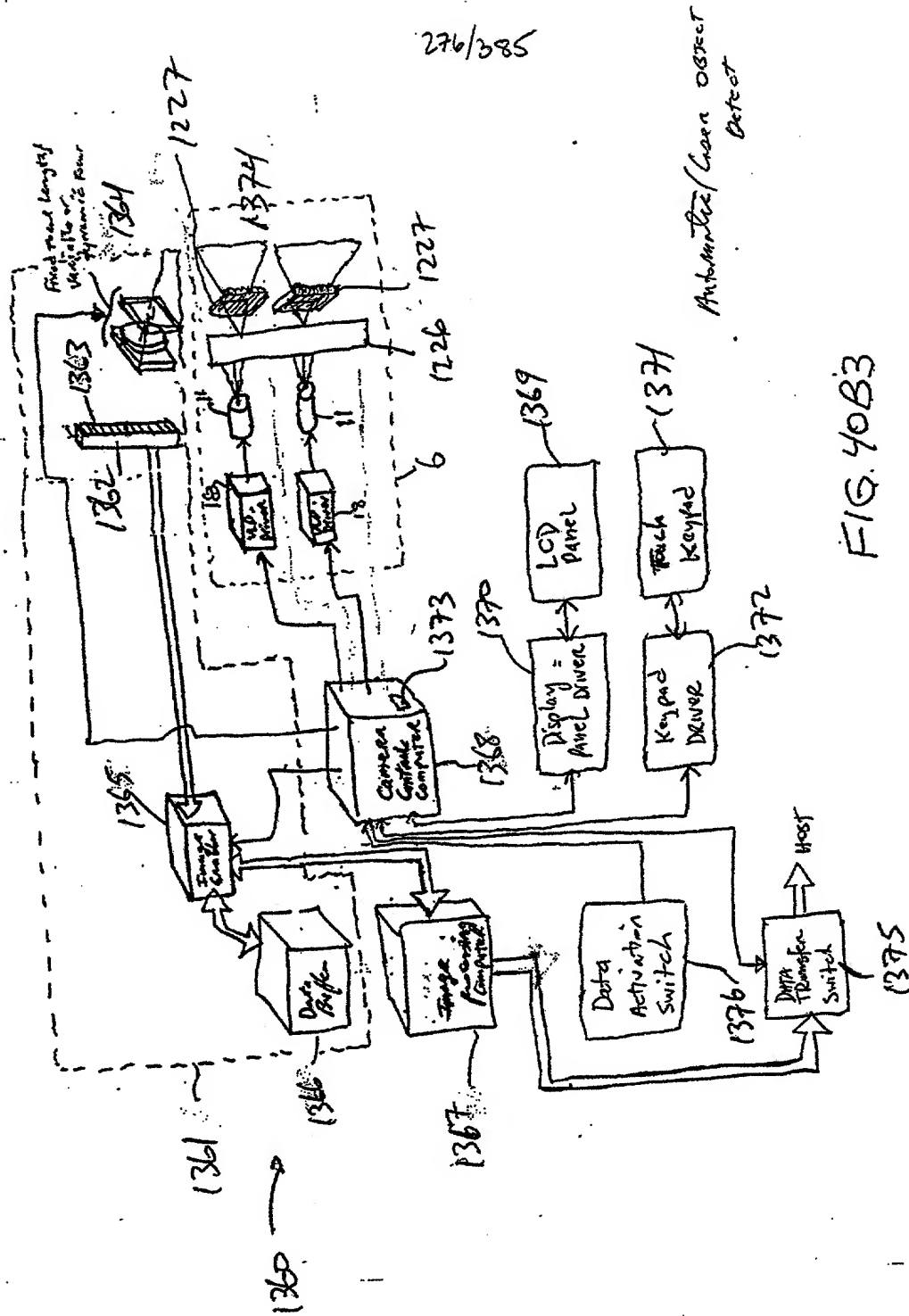
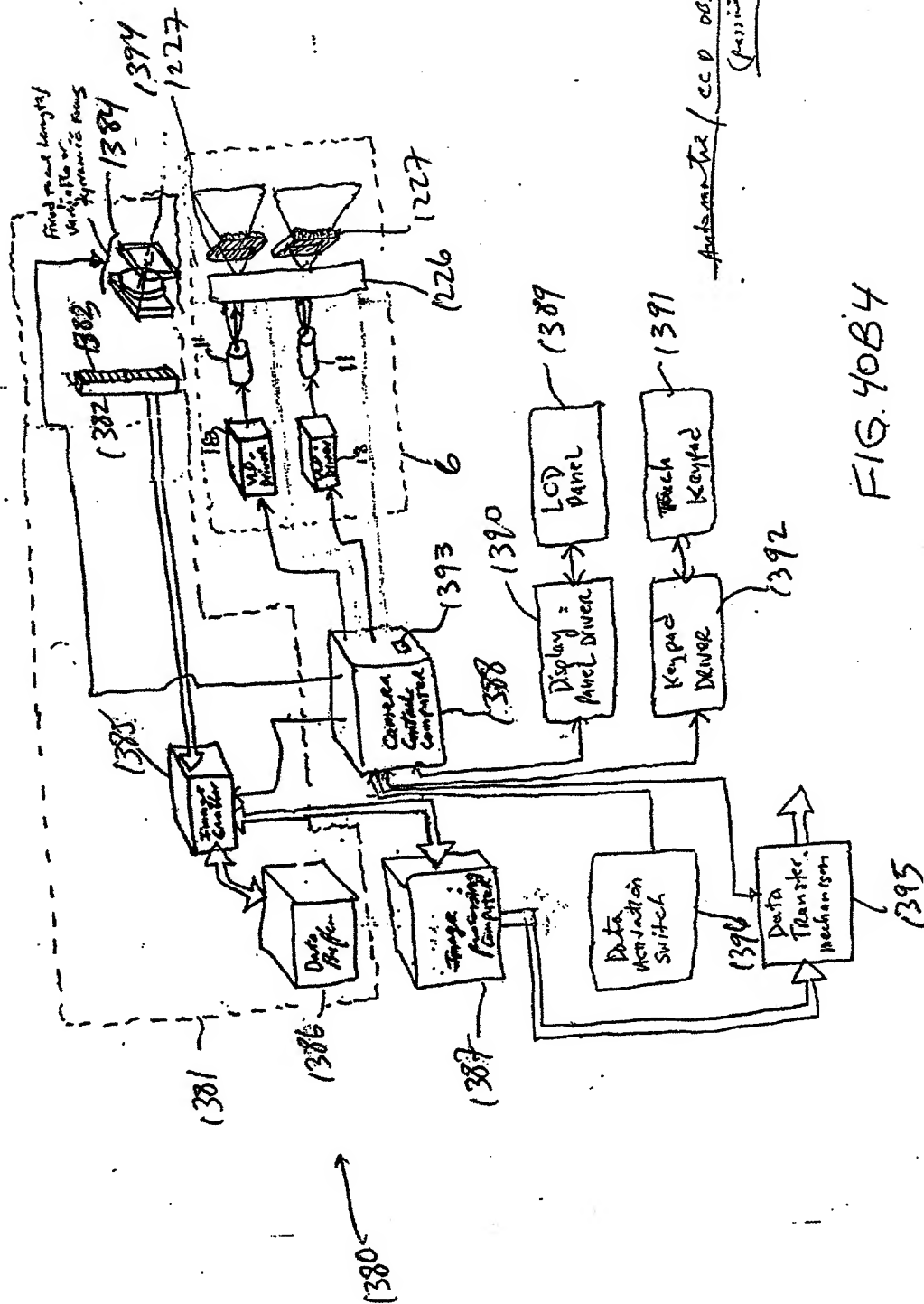


FIG. 40B2



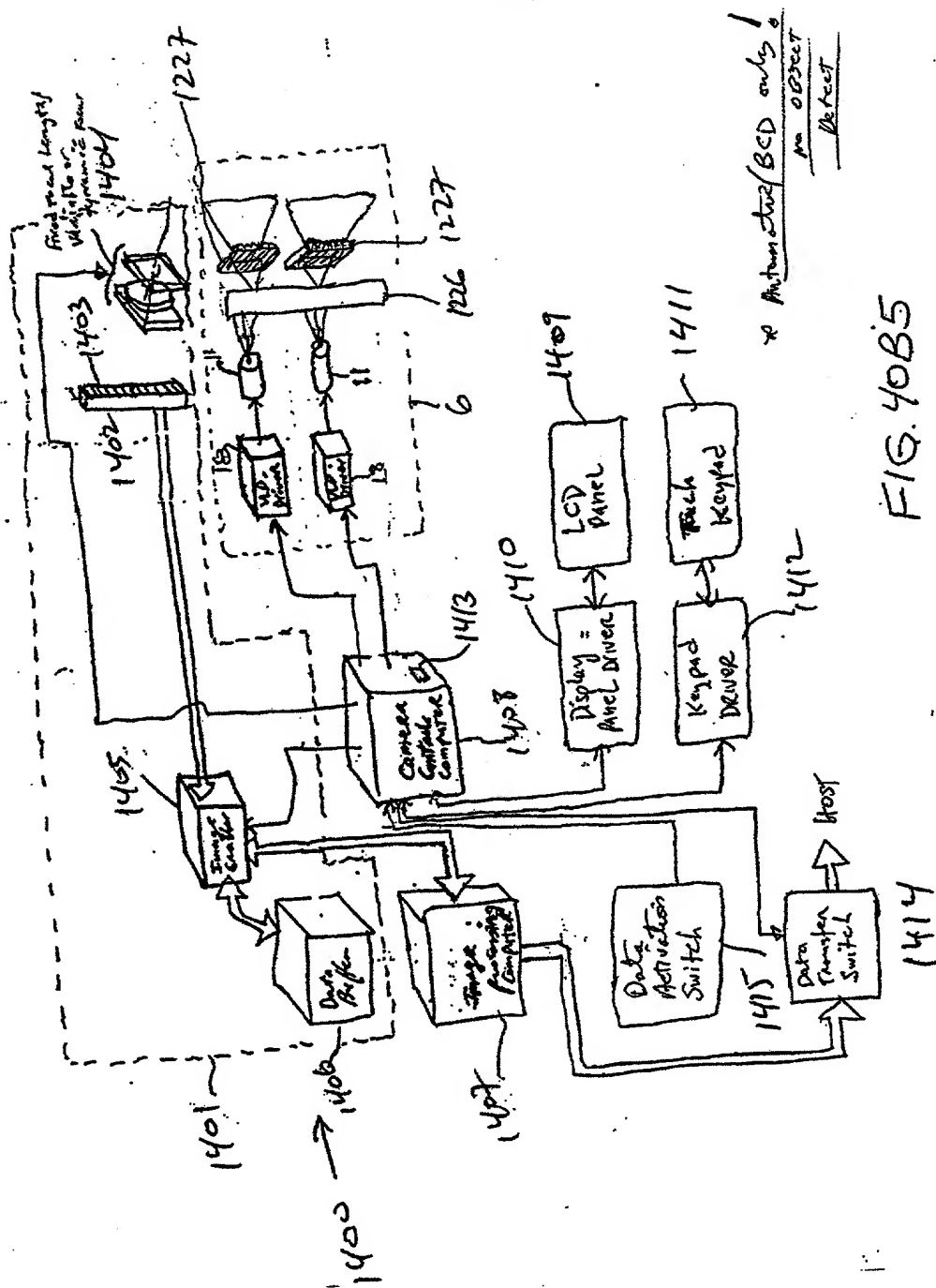
277/385



Autonomous / CCD object select.  
(passive)

FIG. 40B4

278/385

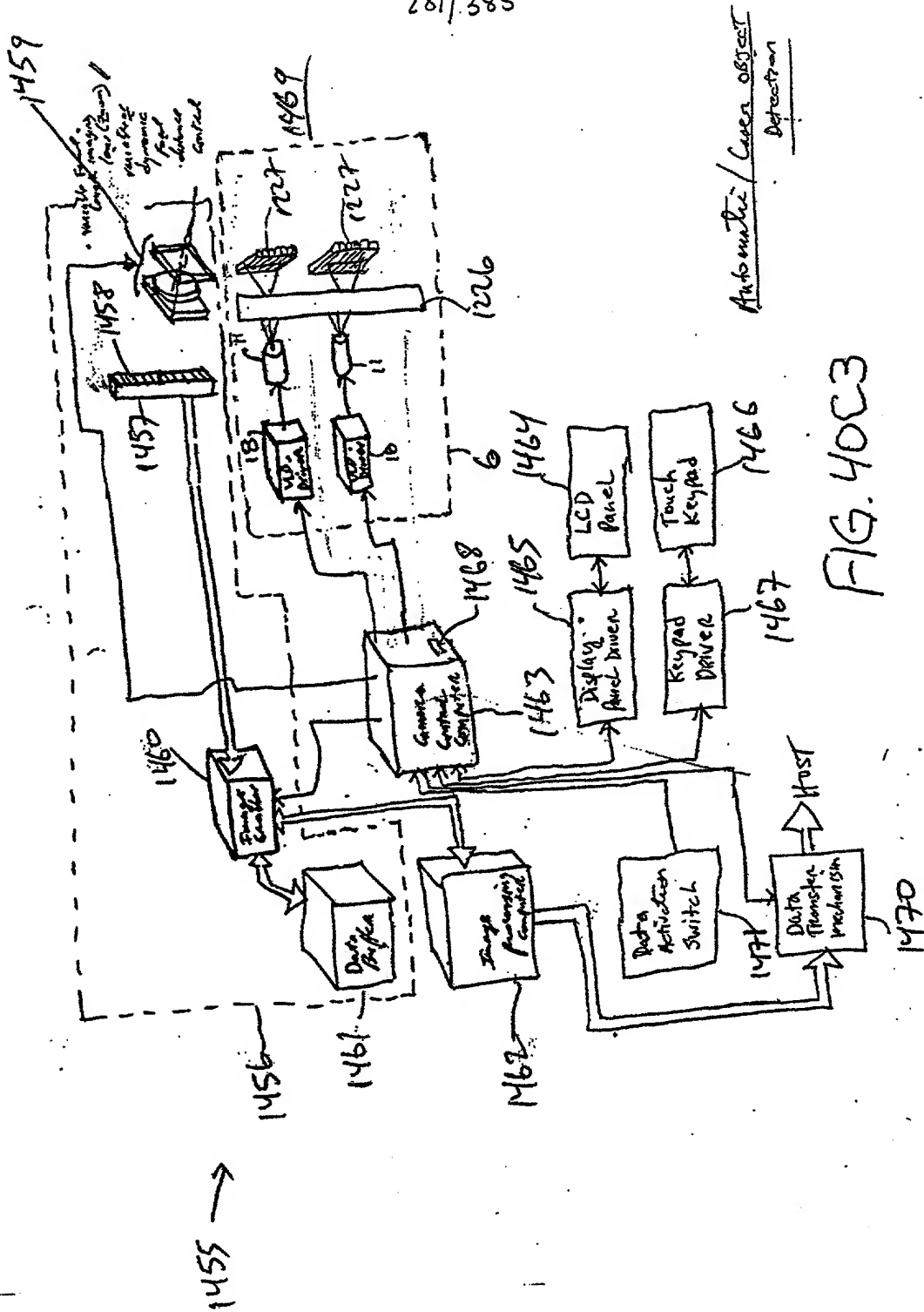


Automated/BED only!  
no object  
Detect



280/385,





282/385

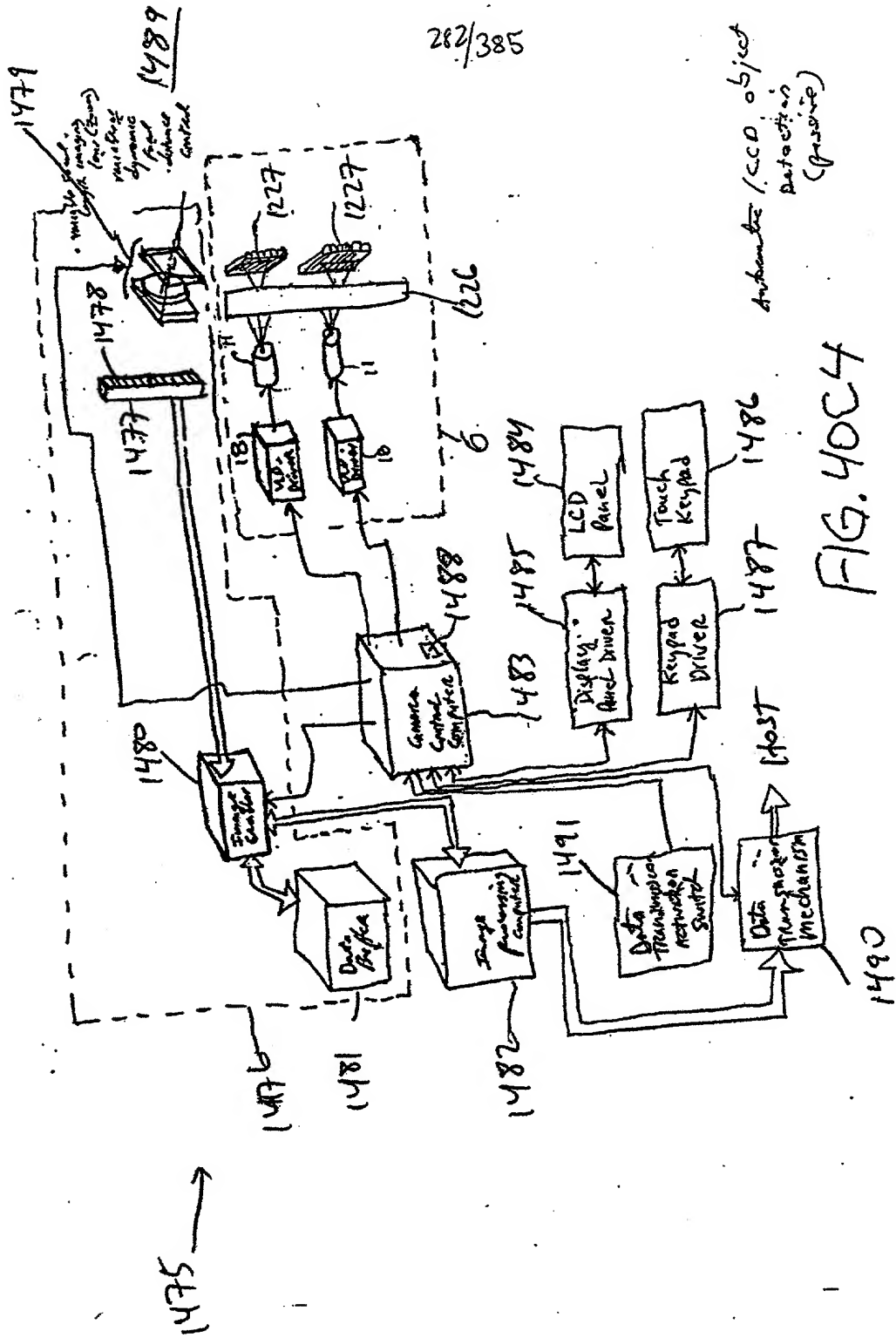
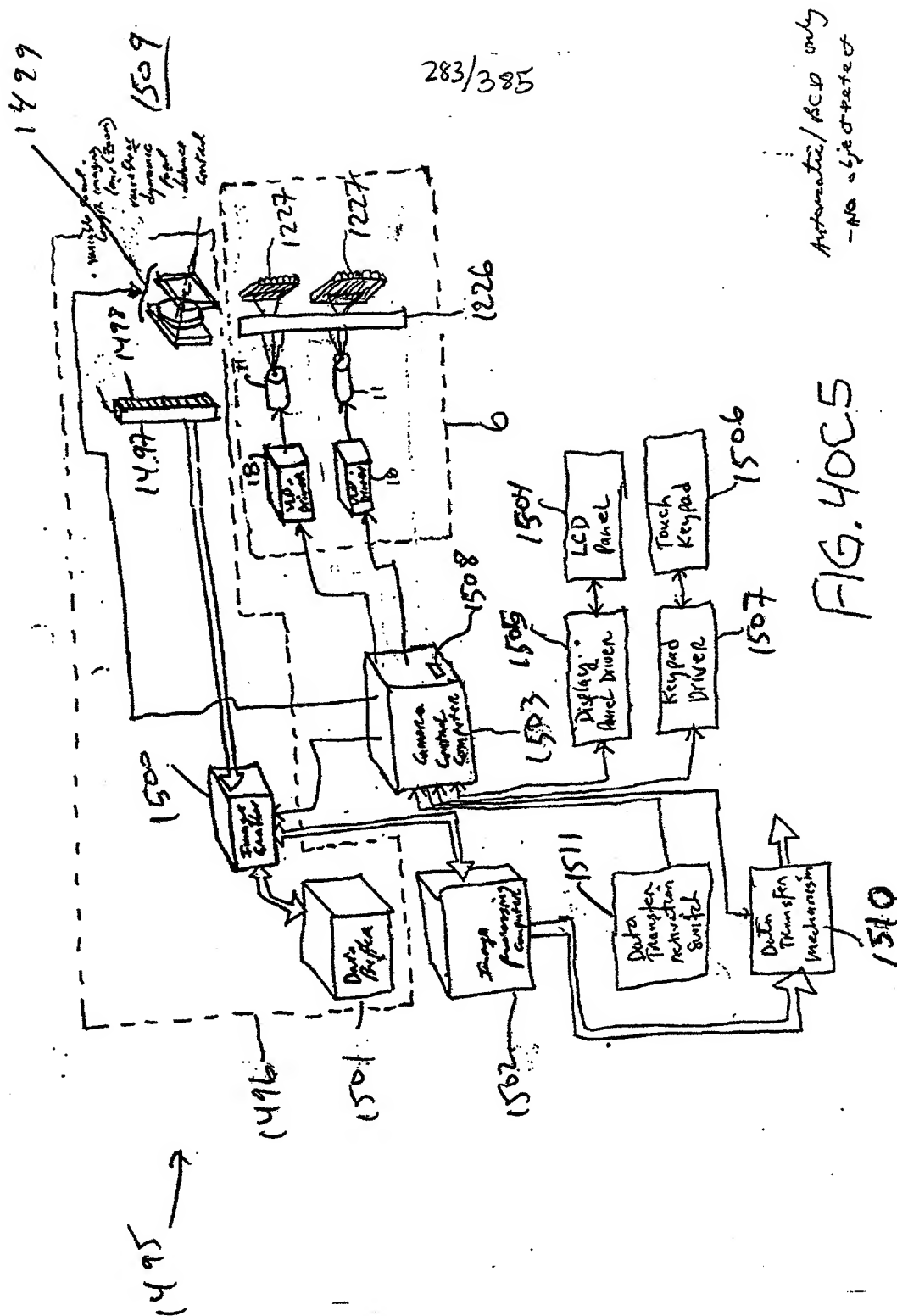


FIG. 40C4



WILLIAM J. BROWN



Autoreactive/BCP only  
-No subject

FIG. 40C5

284/385

1-D  
display

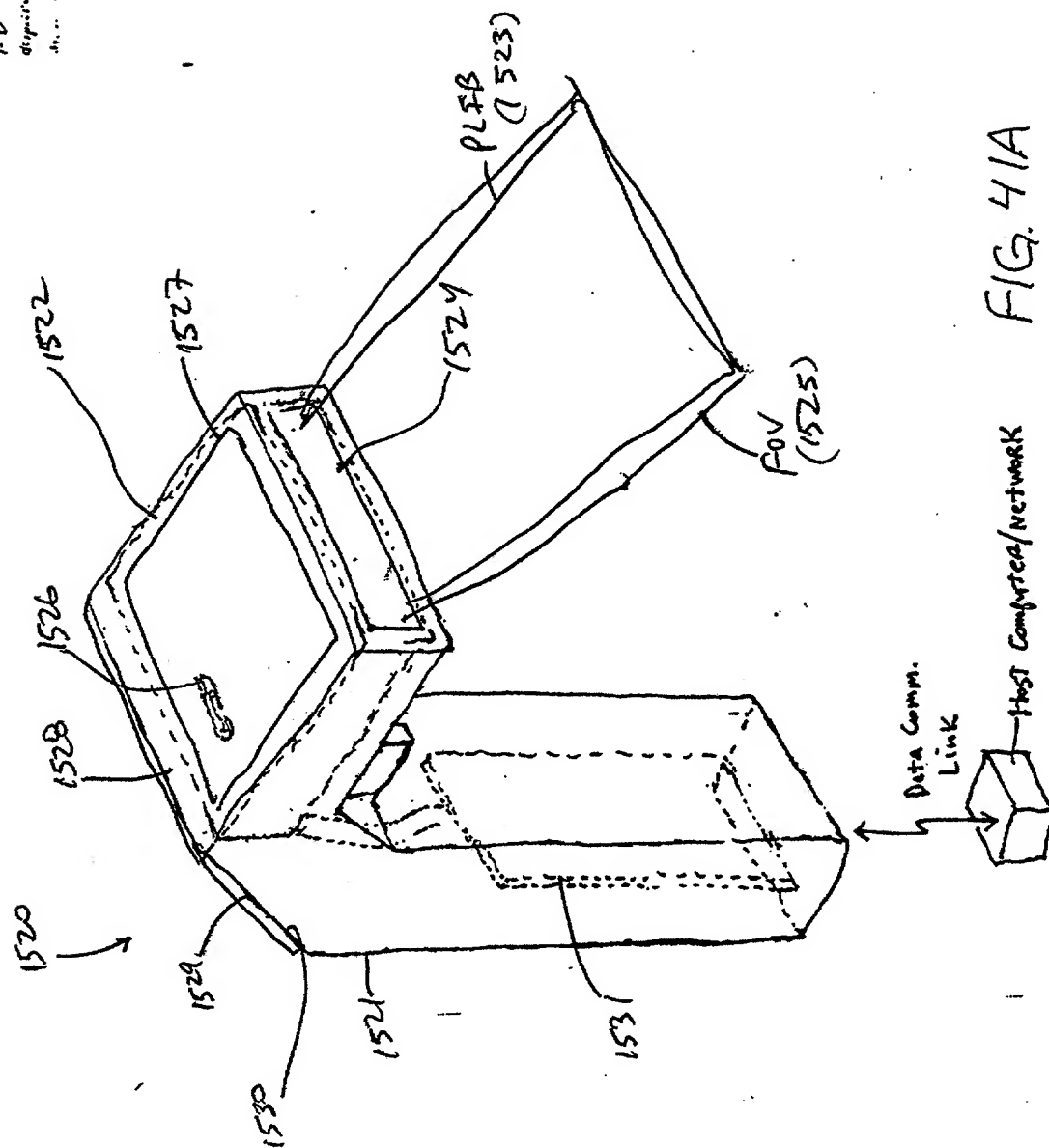


FIG. 41A

285/385

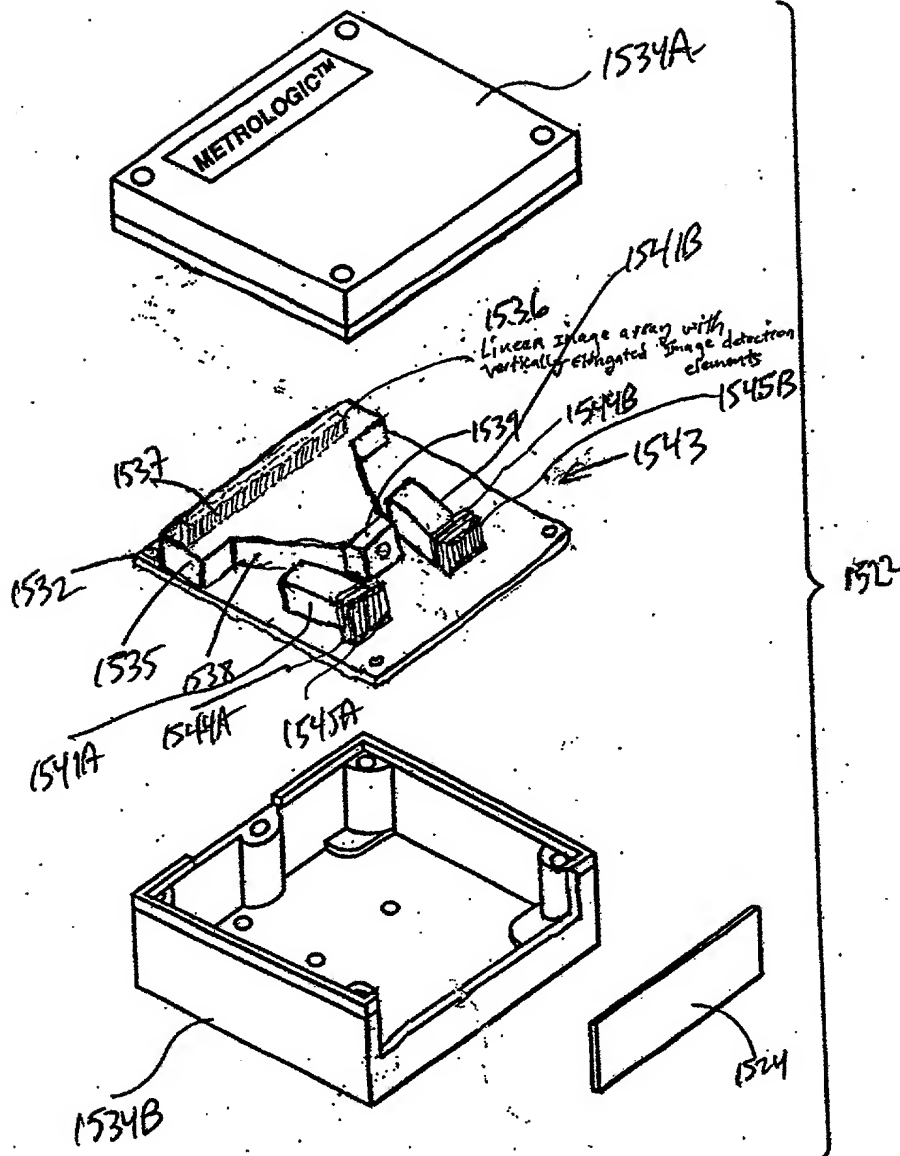


FIG. 41B

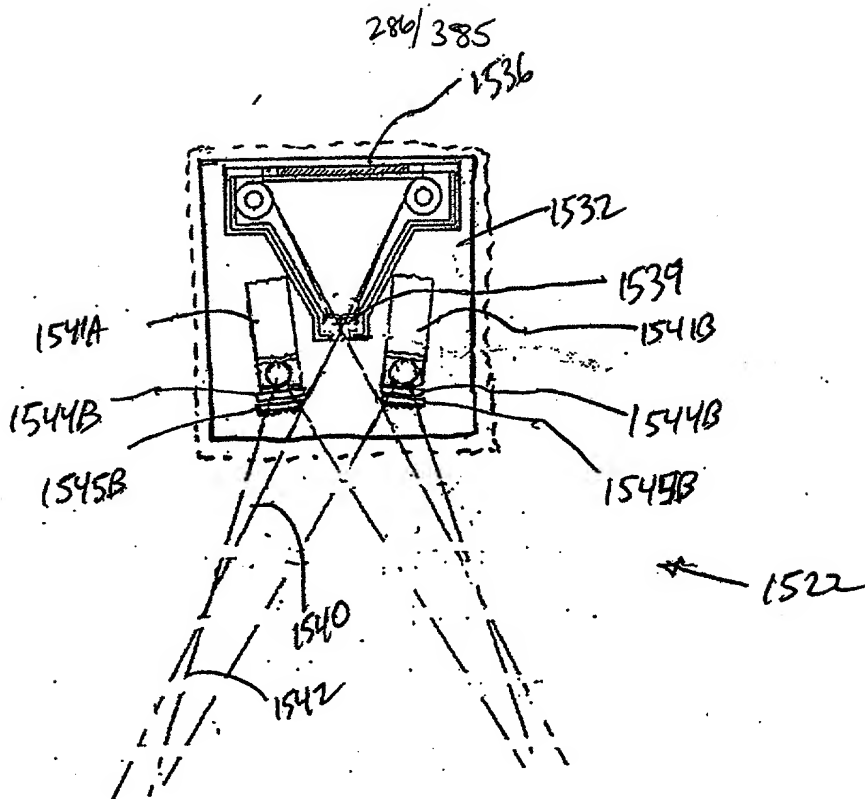


FIG. 41C

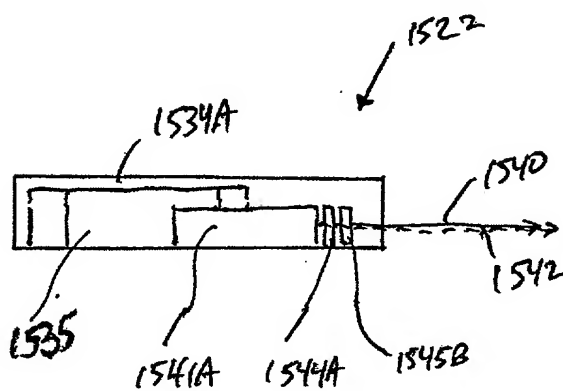


FIG. 41D

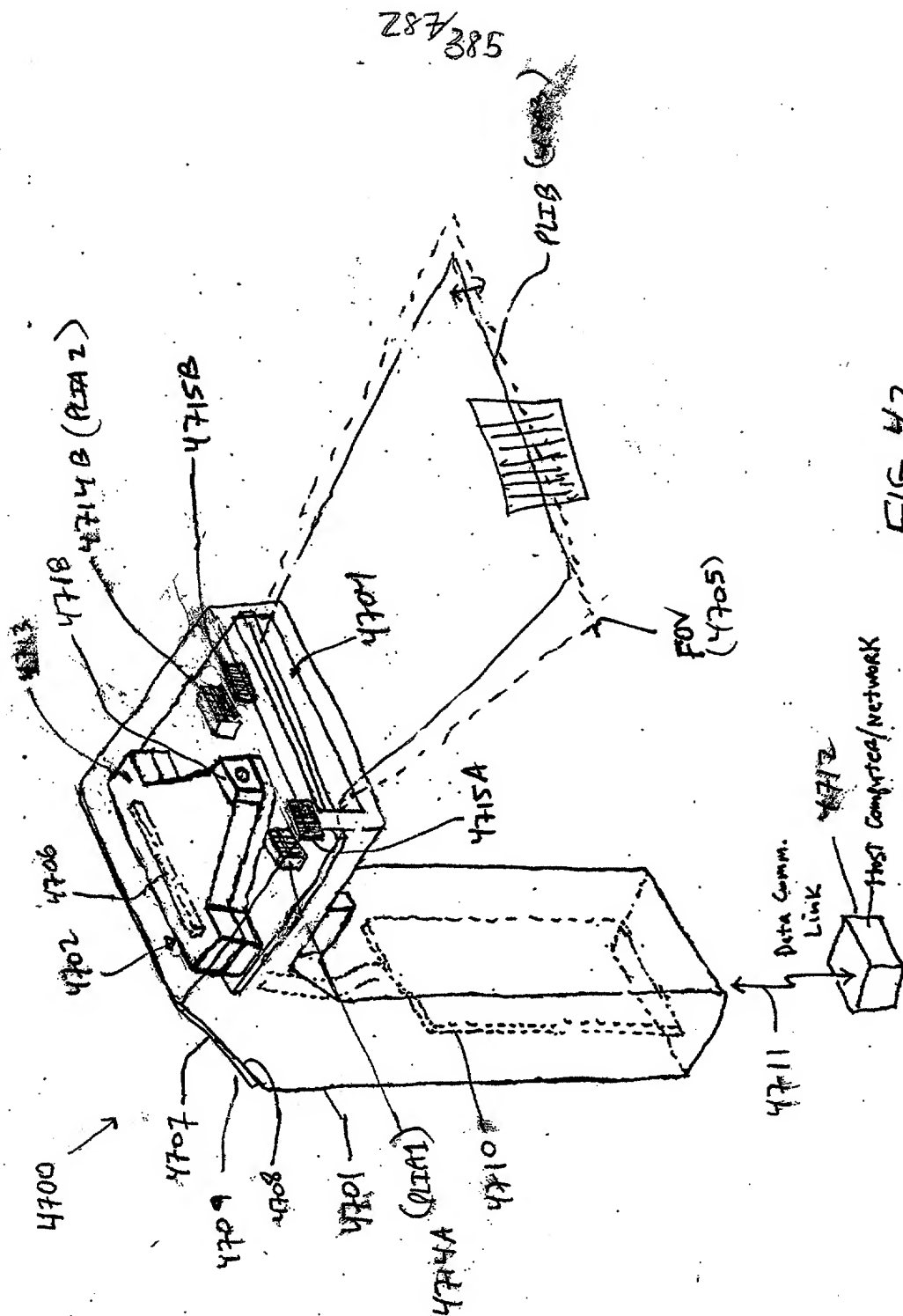


FIG 42

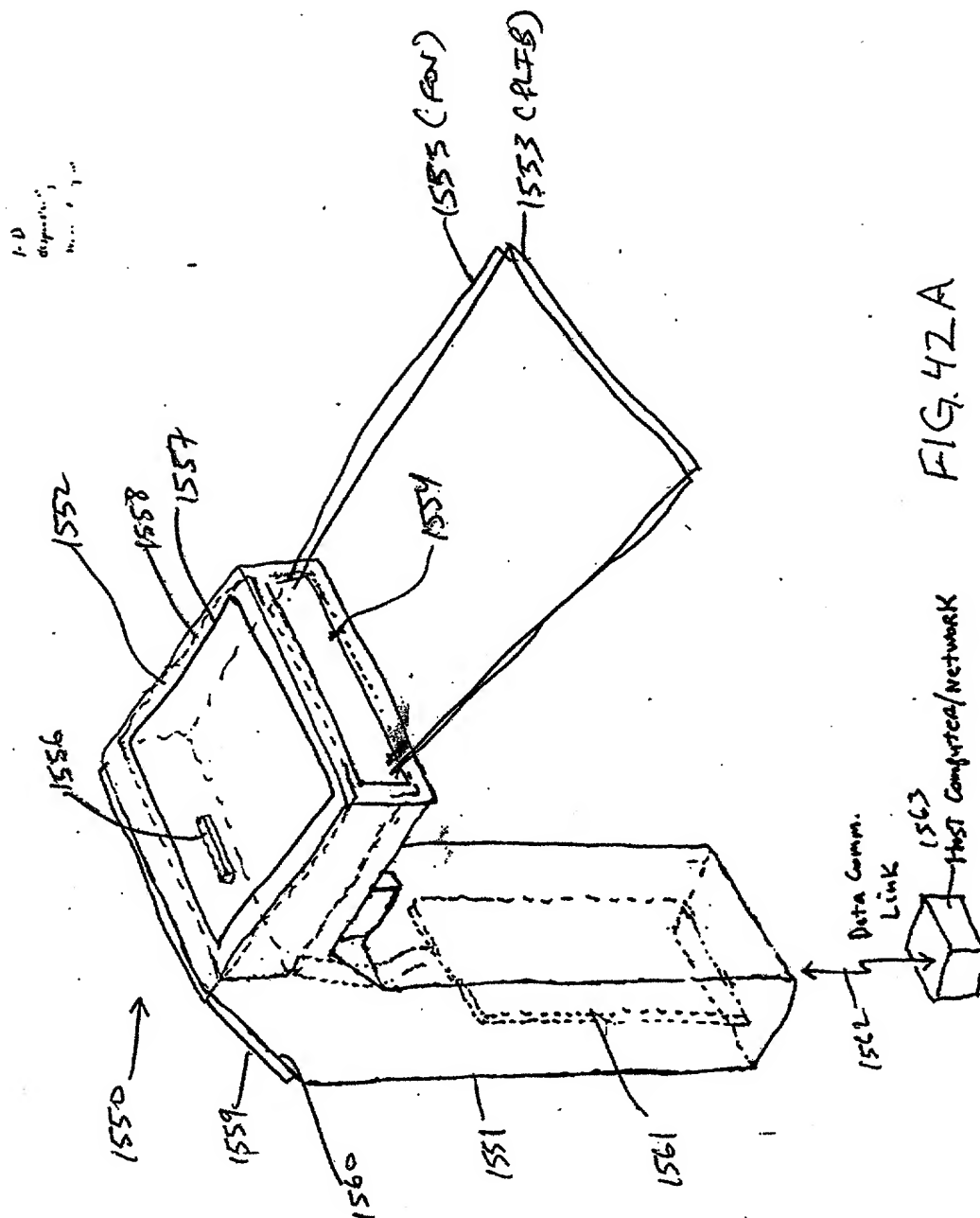


FIG. 42A

289/385

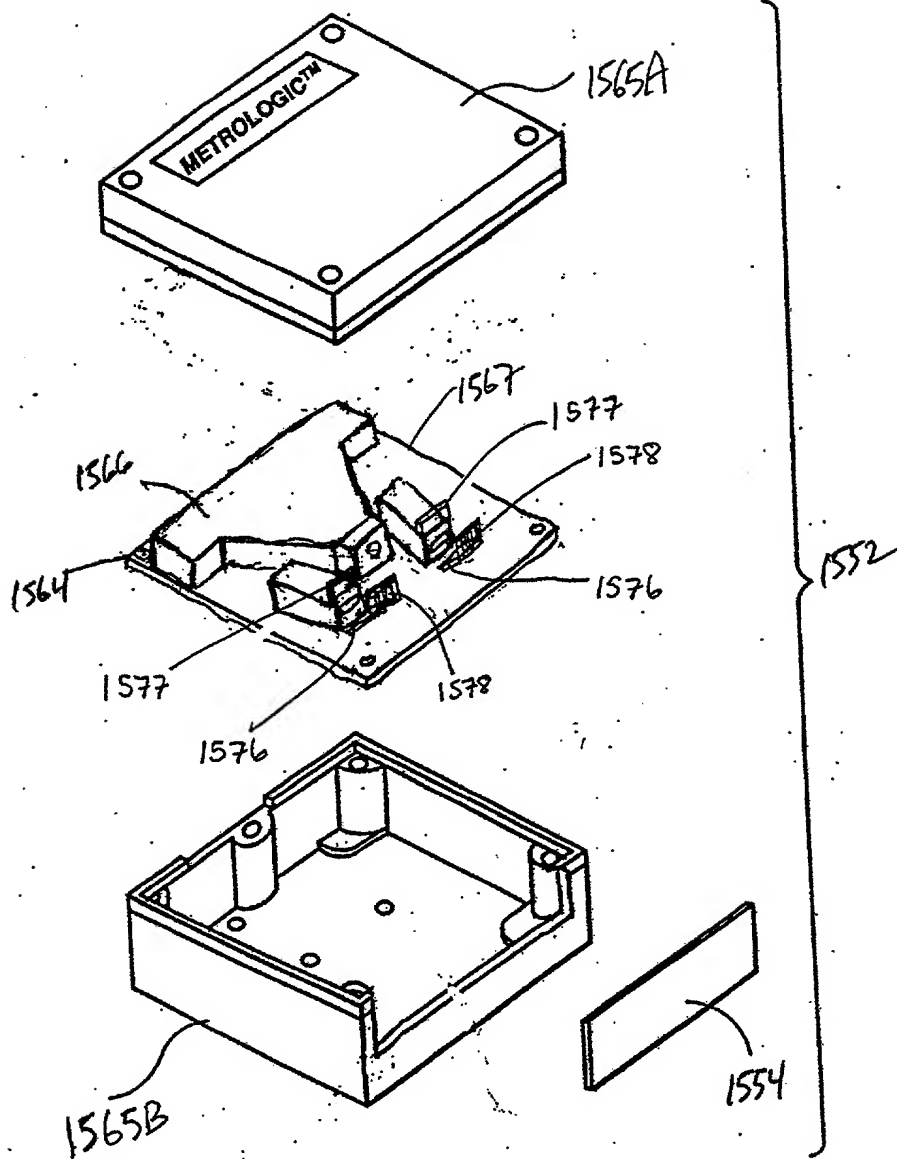


FIG. 42B

10068452.020702

290/385

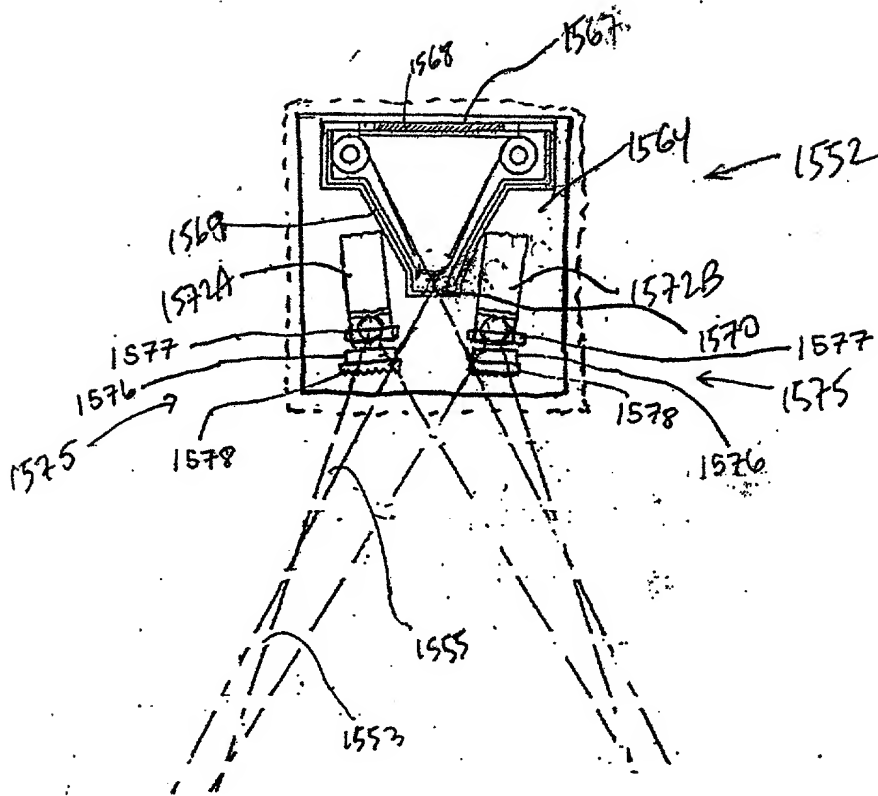


FIG. 42C

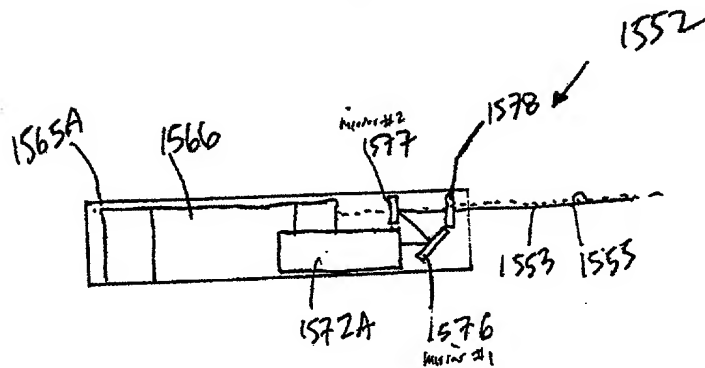


FIG. 42D



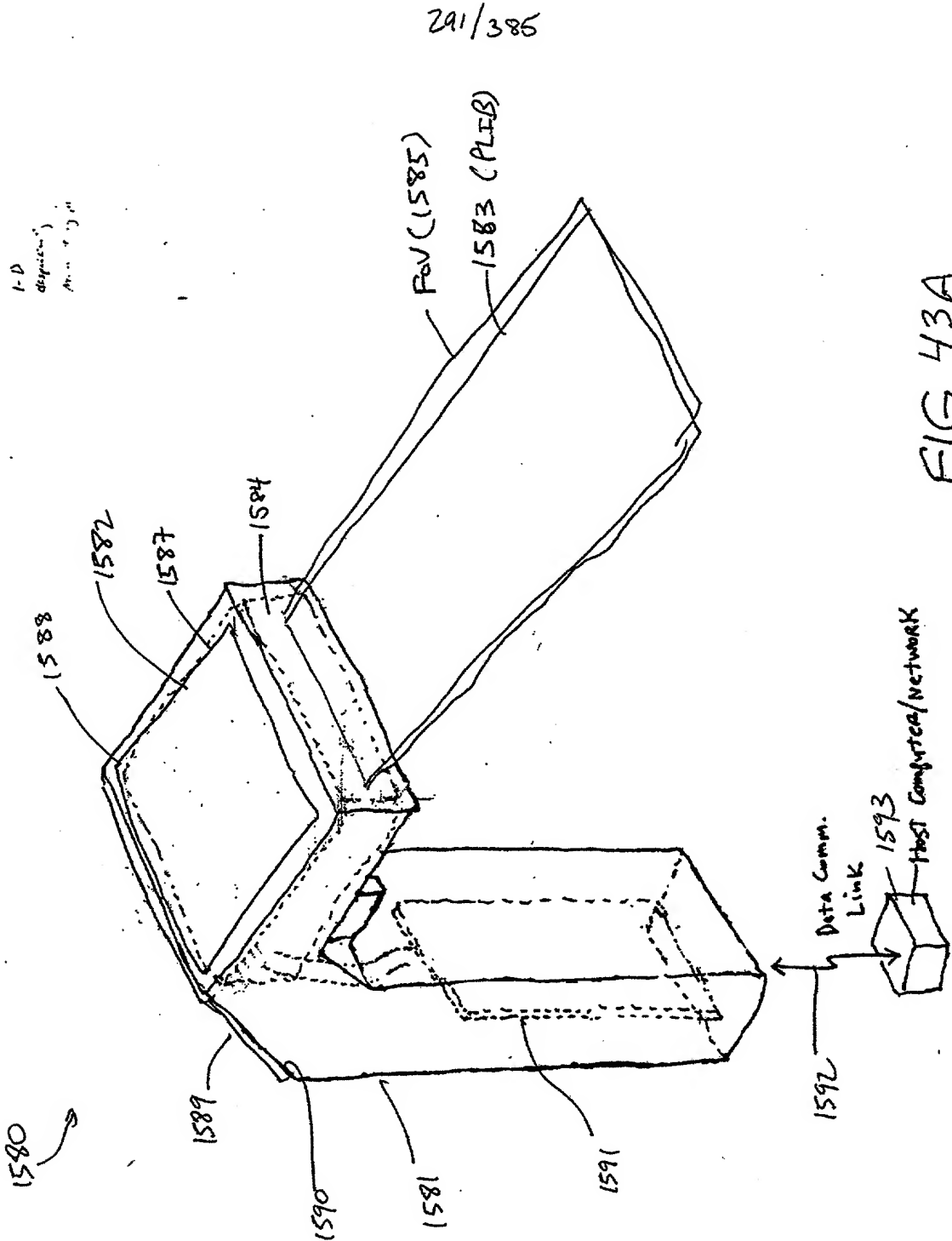


FIG. 43A

10058462.020702

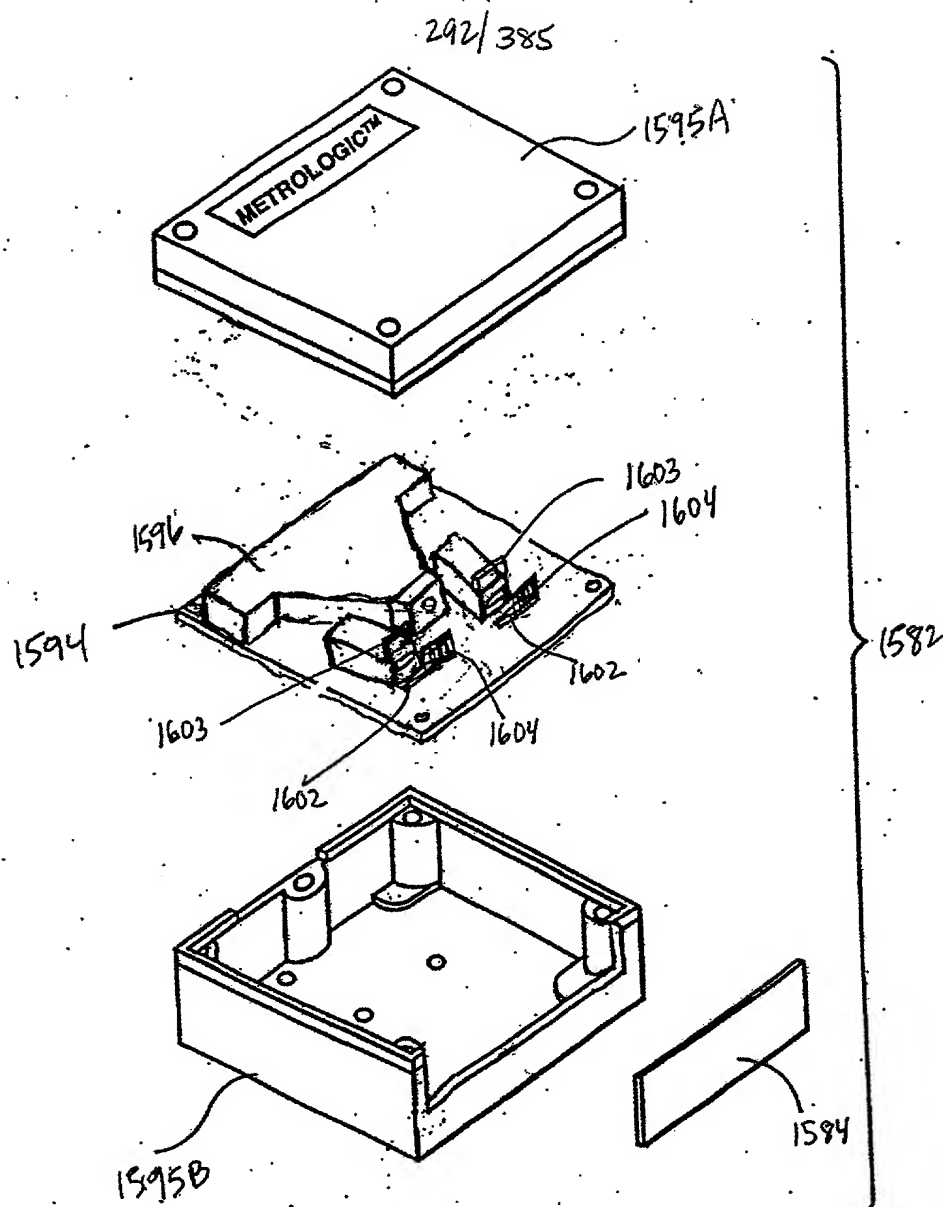


FIG. 43B

293/385

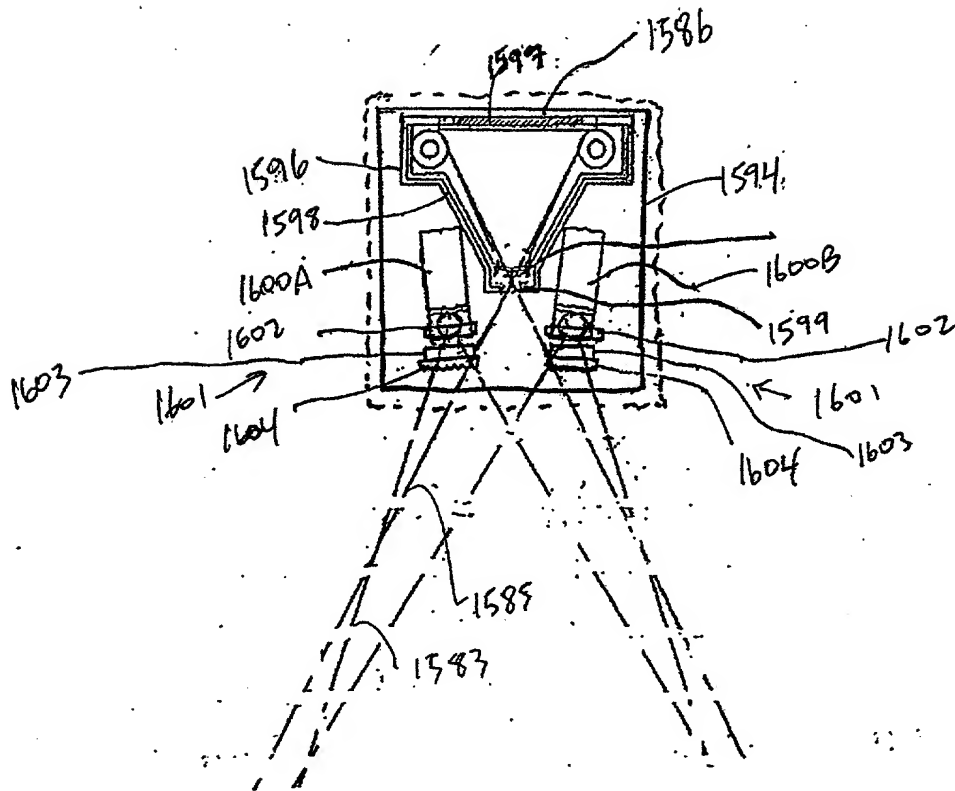


FIG. 43C

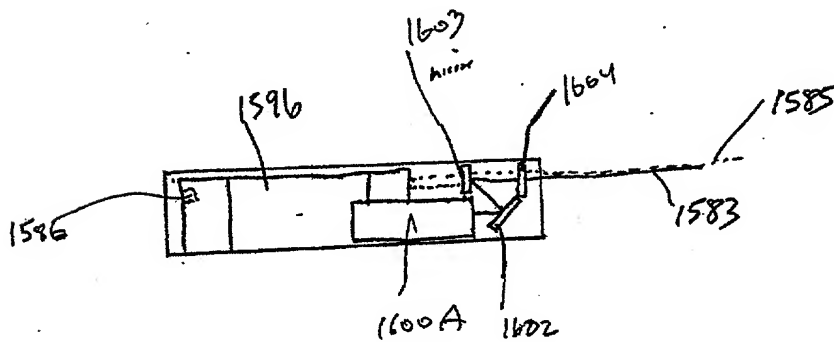


FIG. 43D

294/285

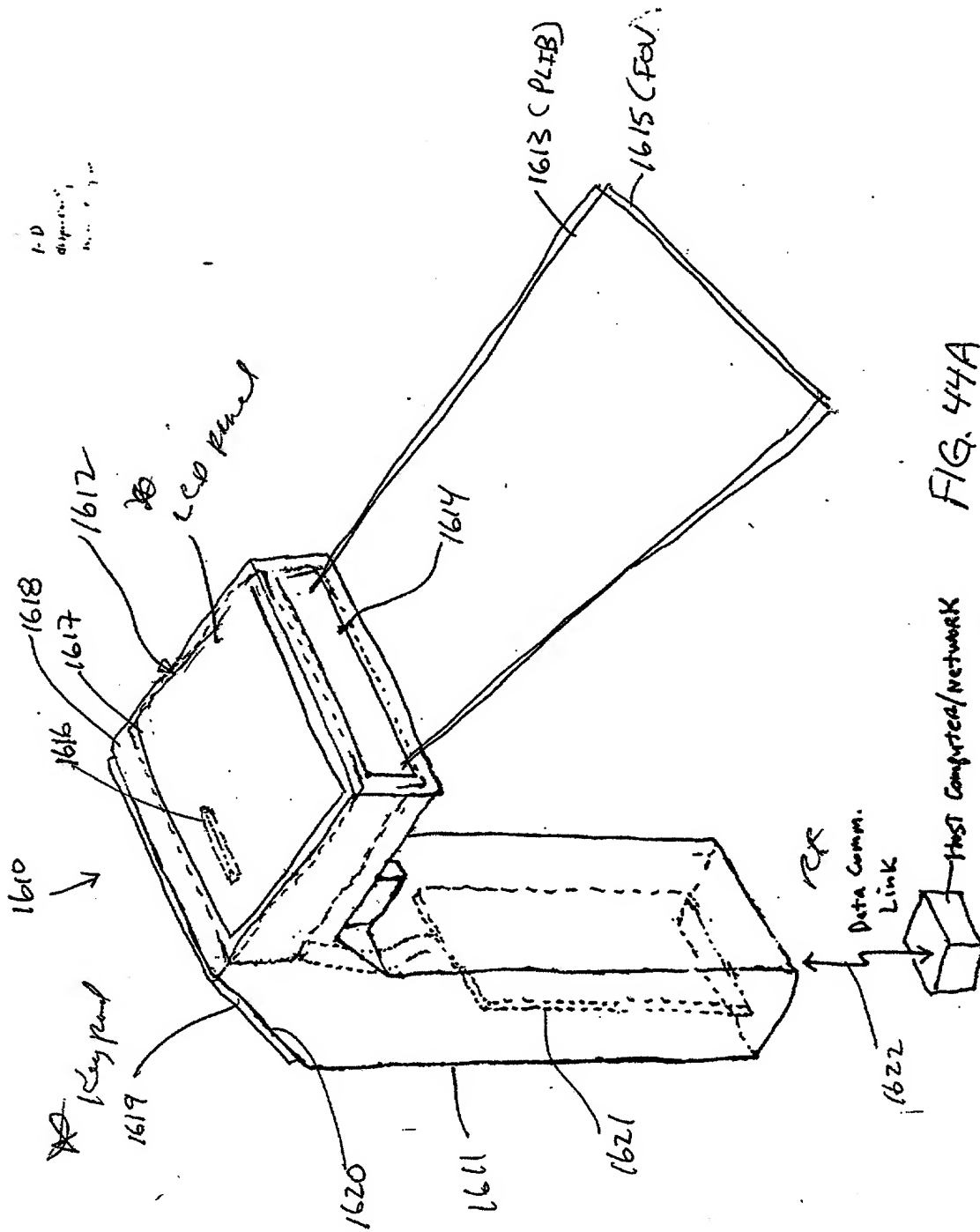


FIG. 44A

10068462.020702

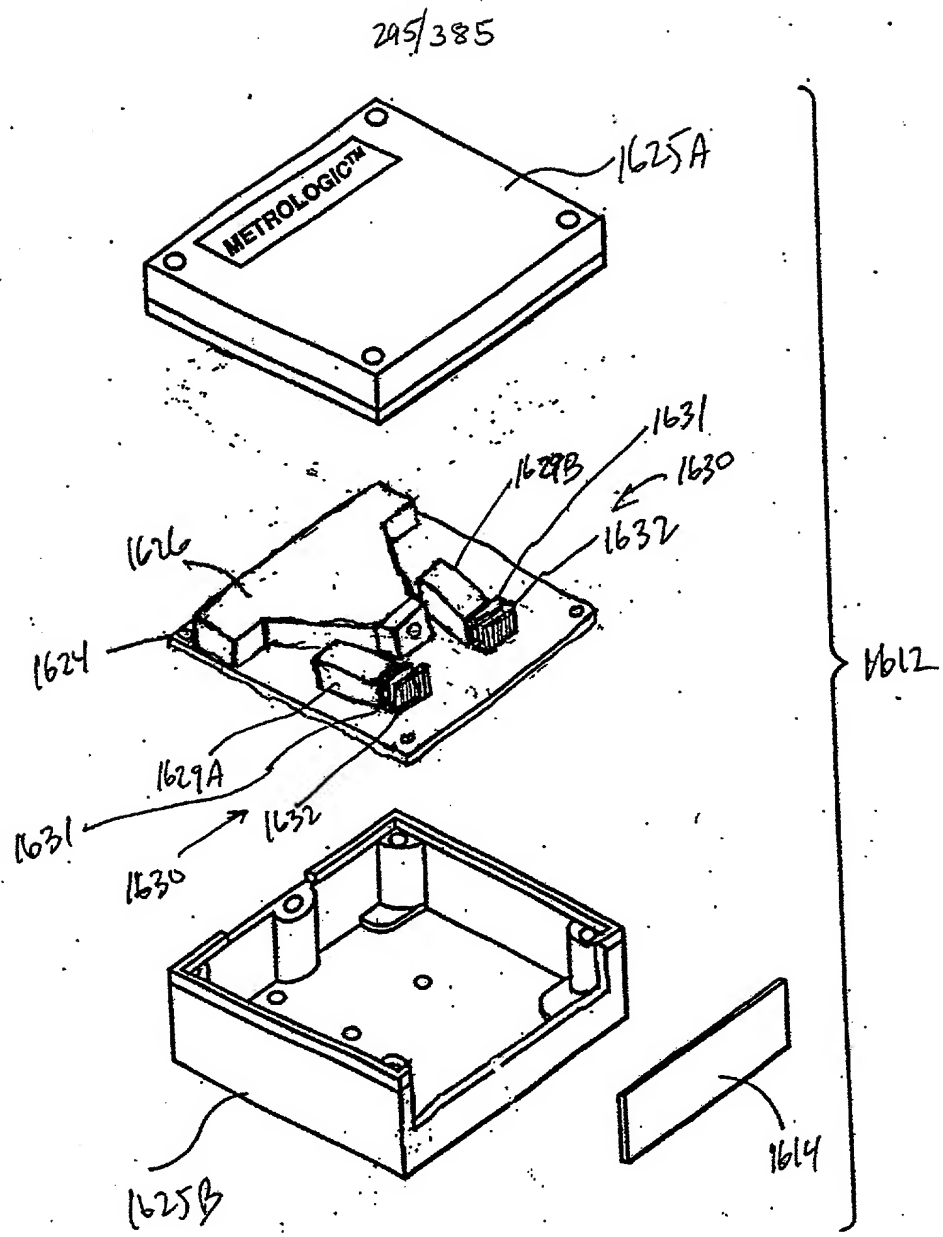


FIG. 44B

296/3857

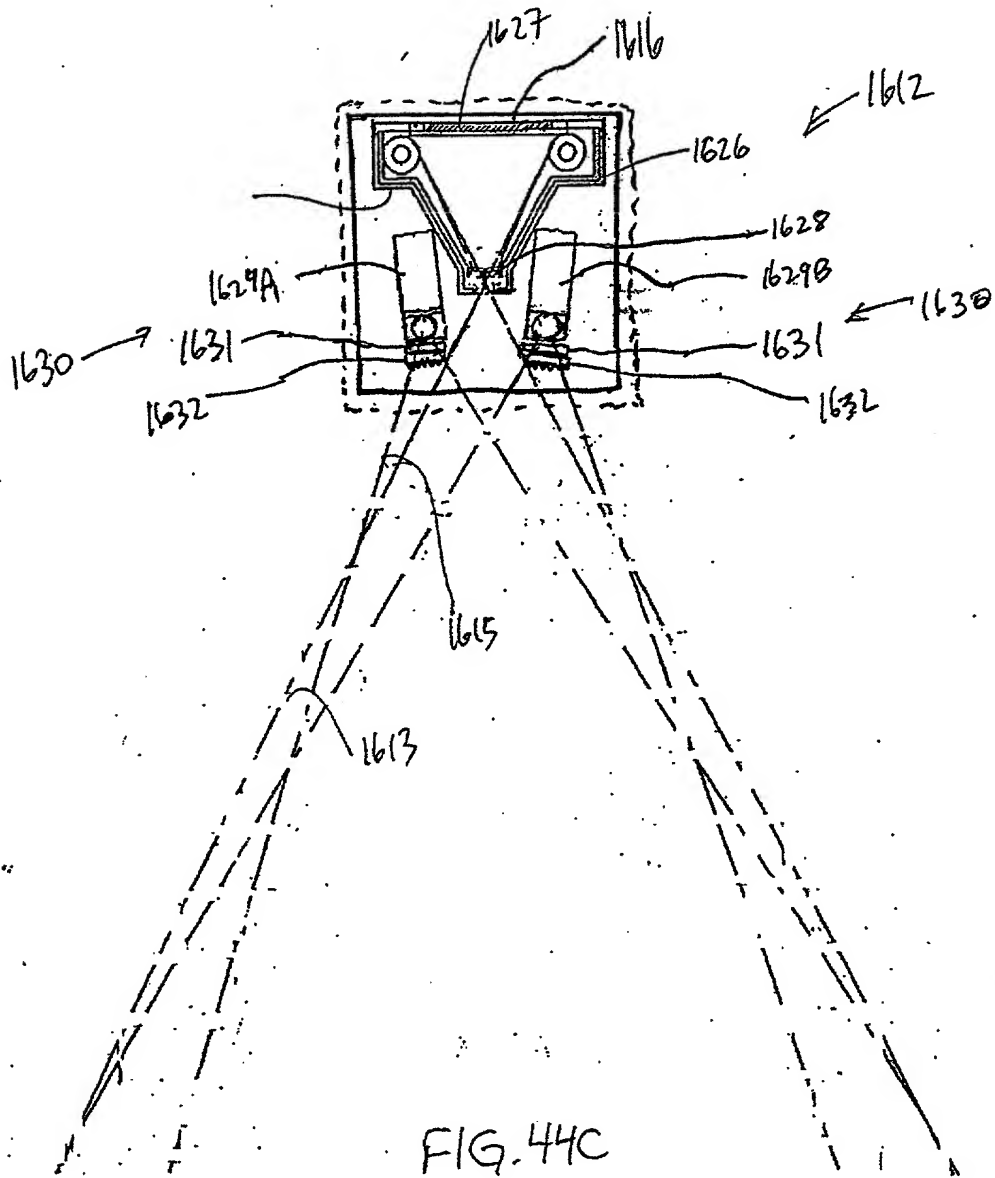


FIG. 44C

1005452.020702

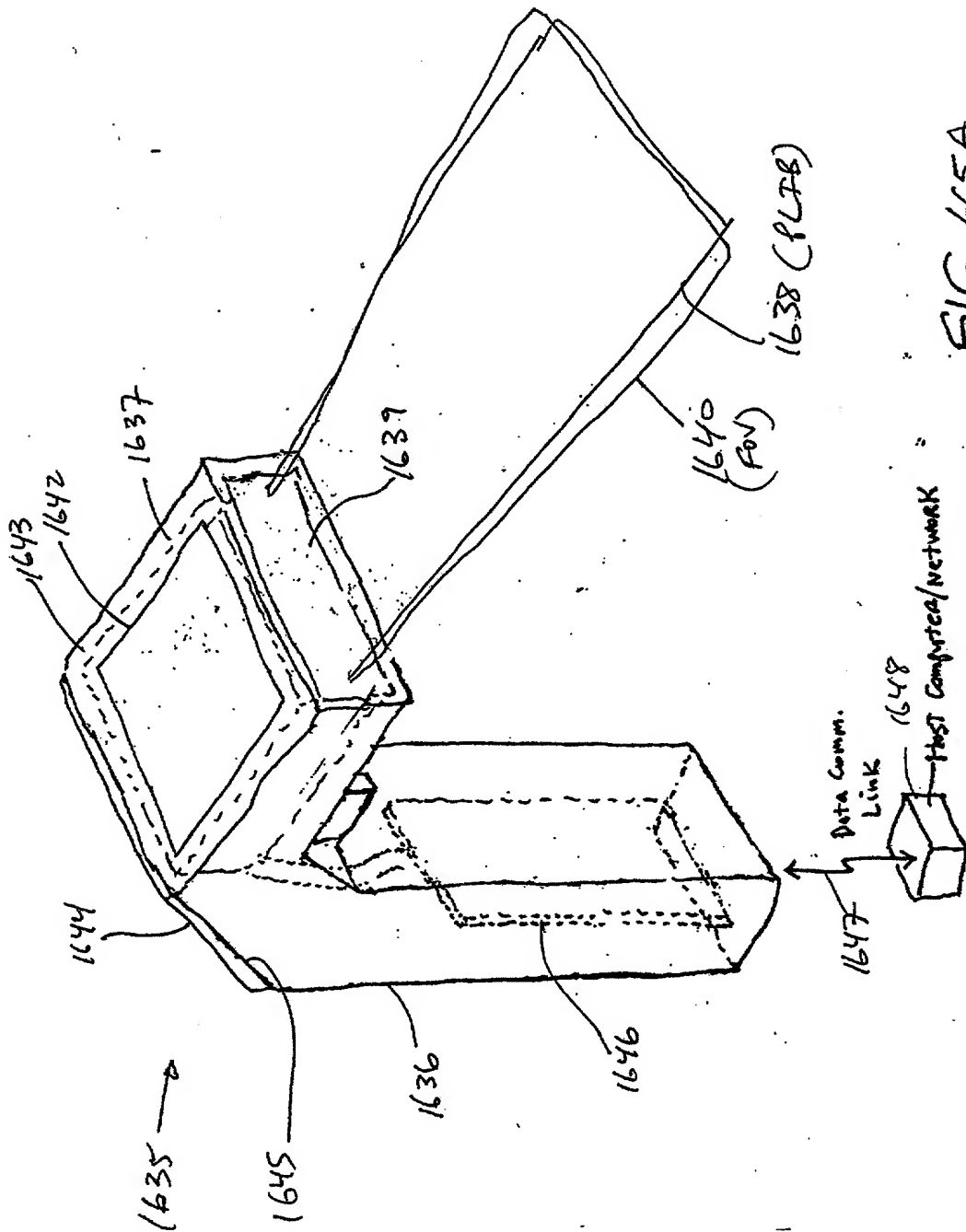


FIG. 45A

298/385

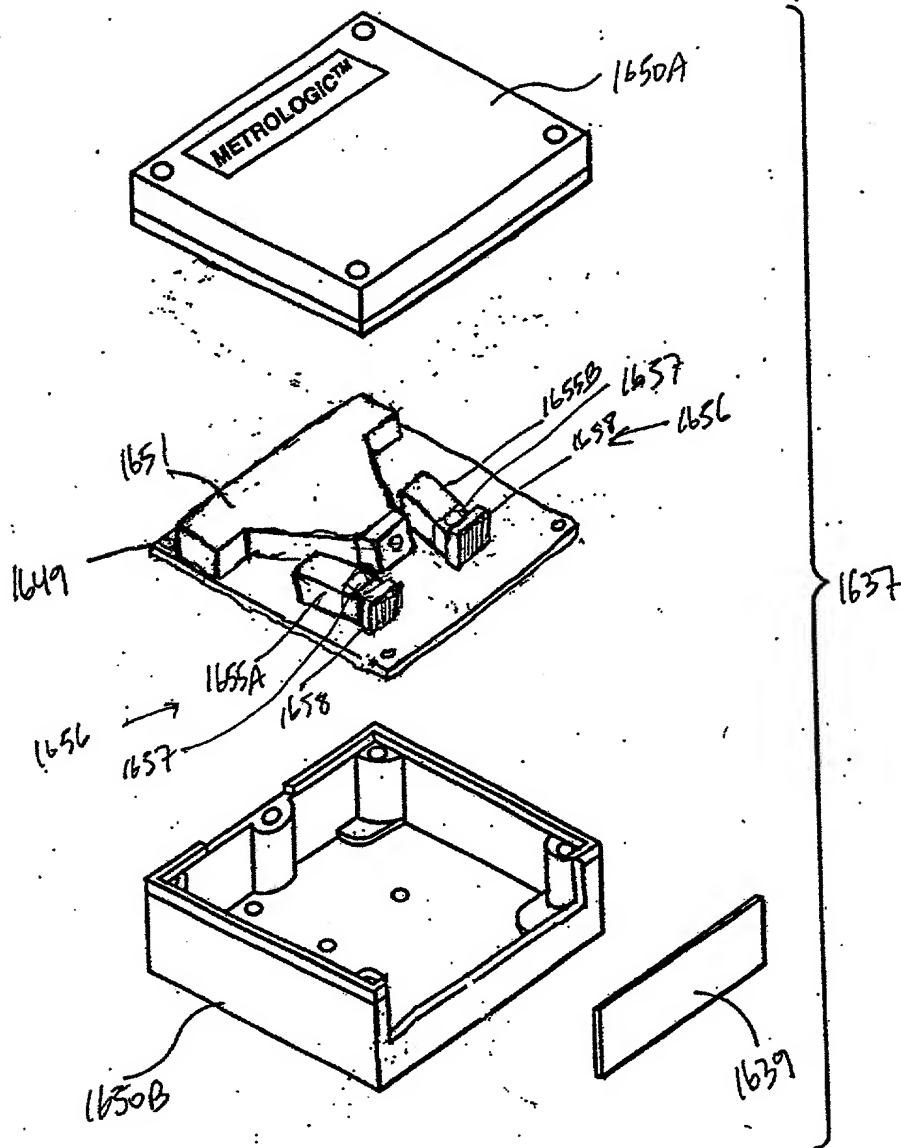


FIG. 45B

1006492.020702



299/385

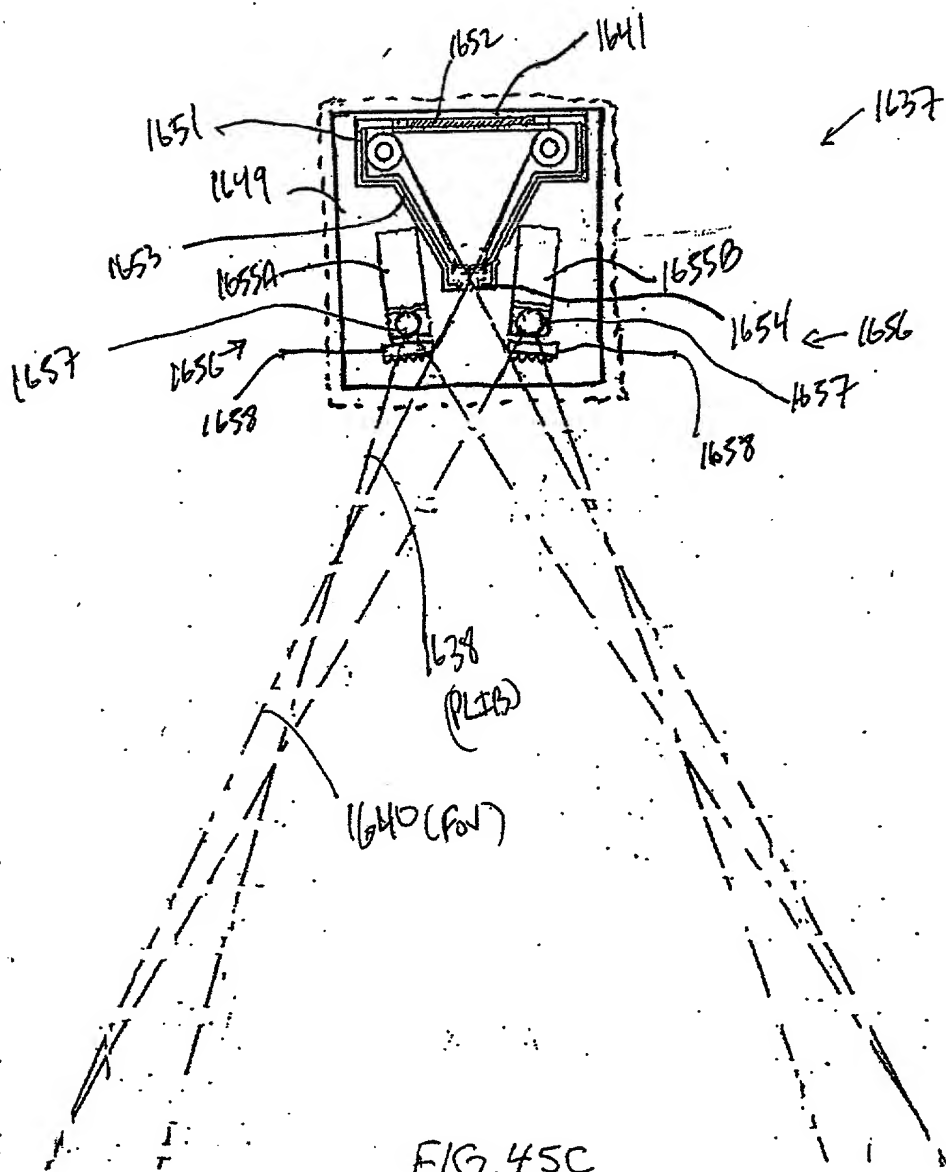


FIG. 45C

10058462.020702

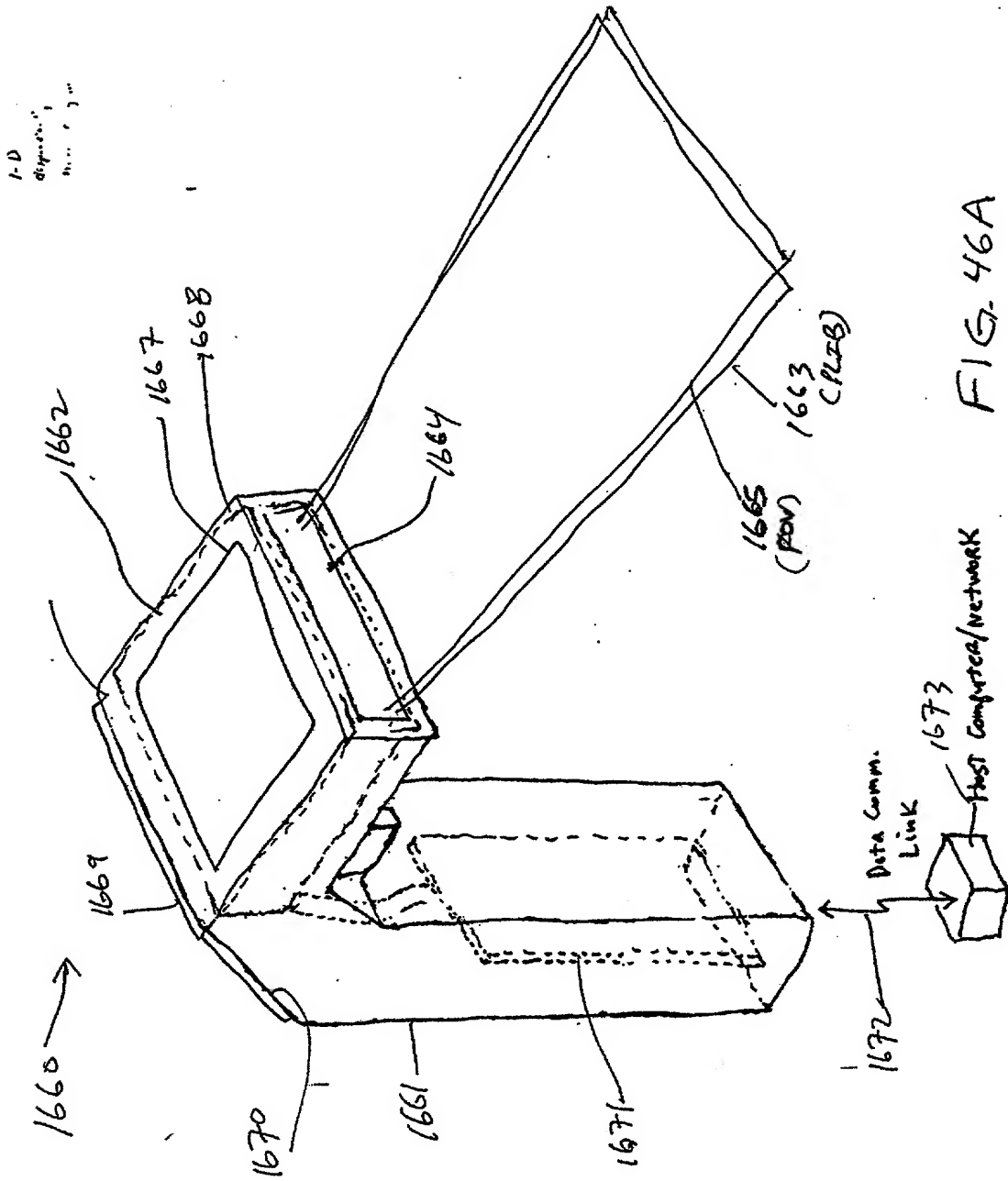


FIG. 46A

1006462.020702

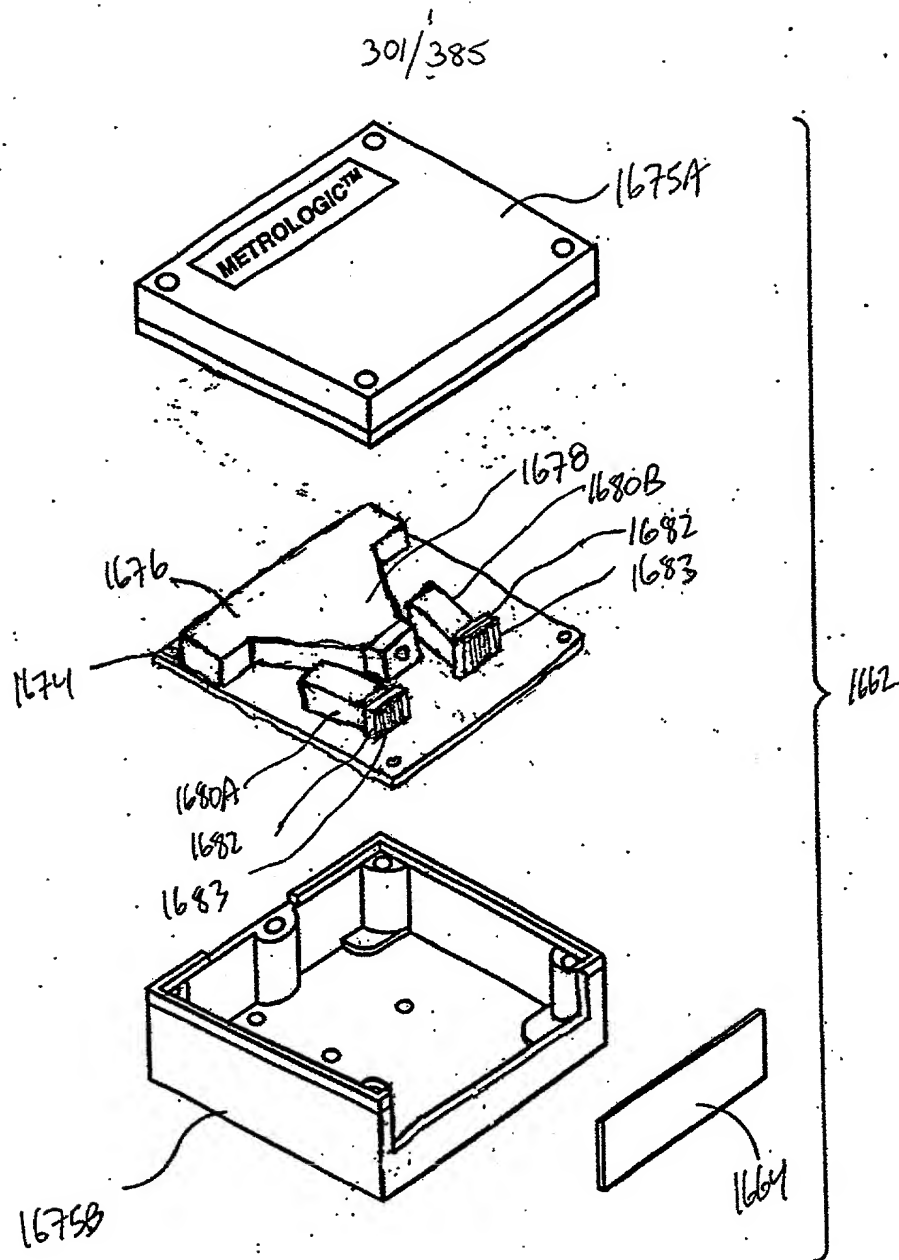
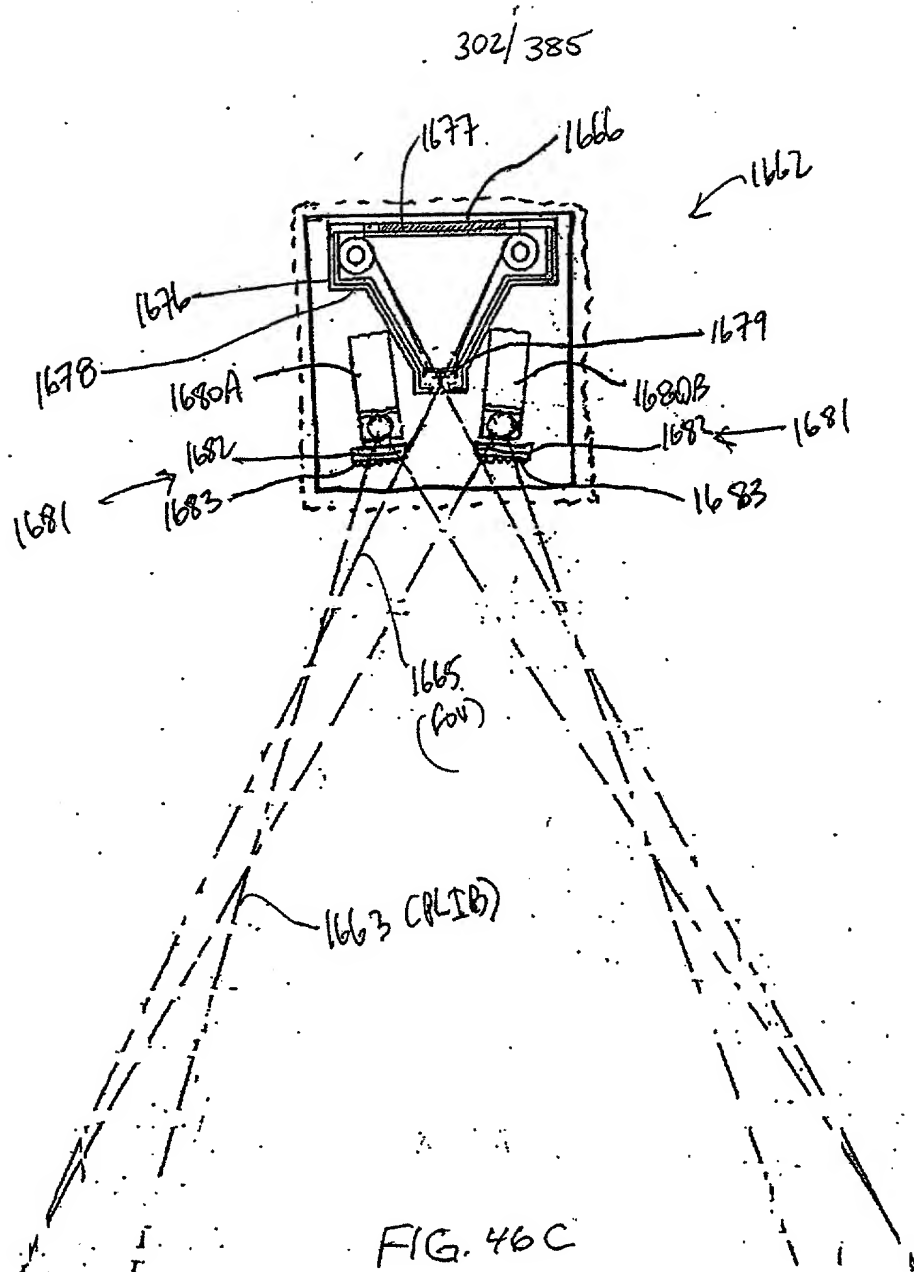
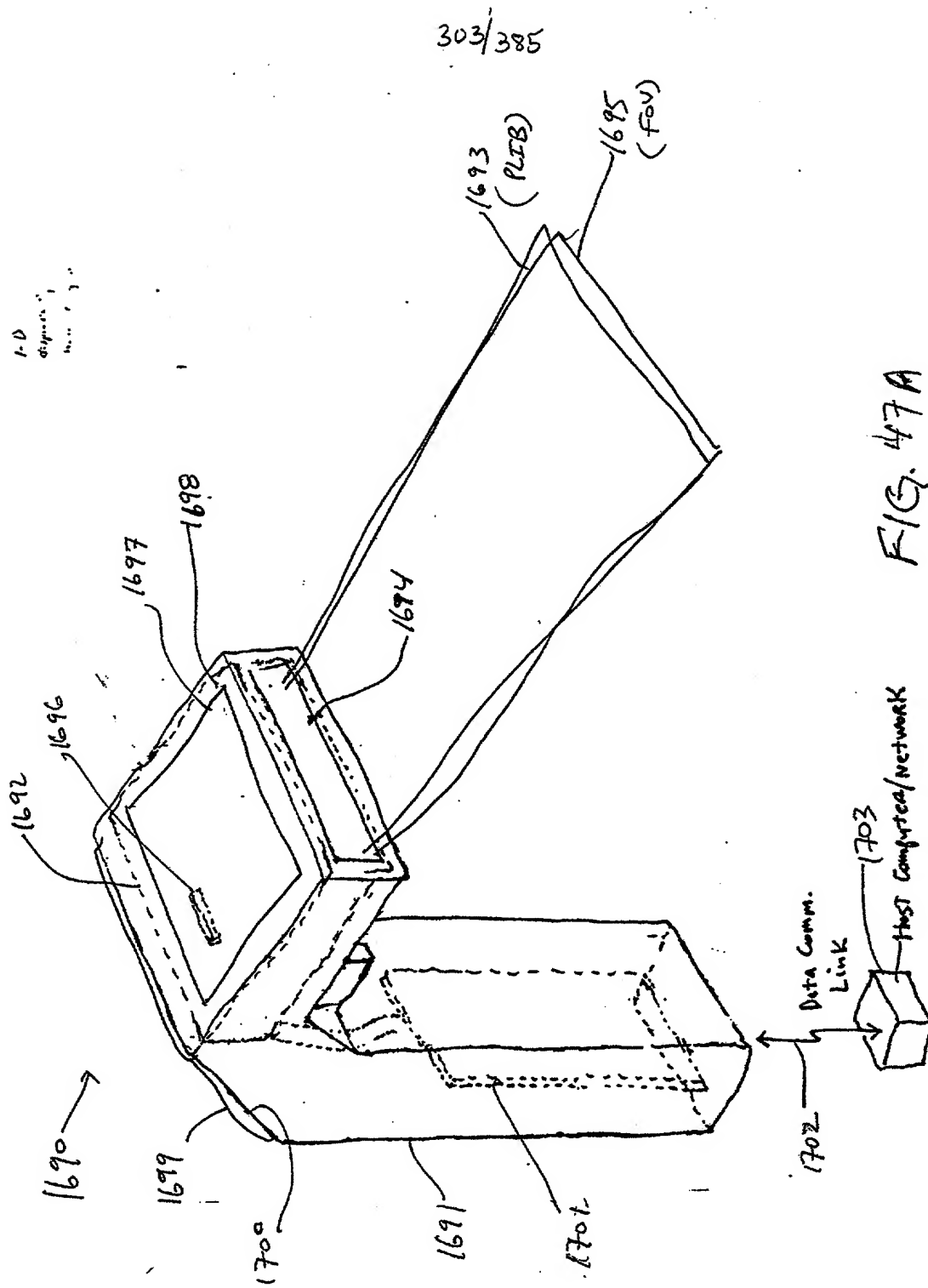


FIG. 46B

10068452.020702





202002-29489001

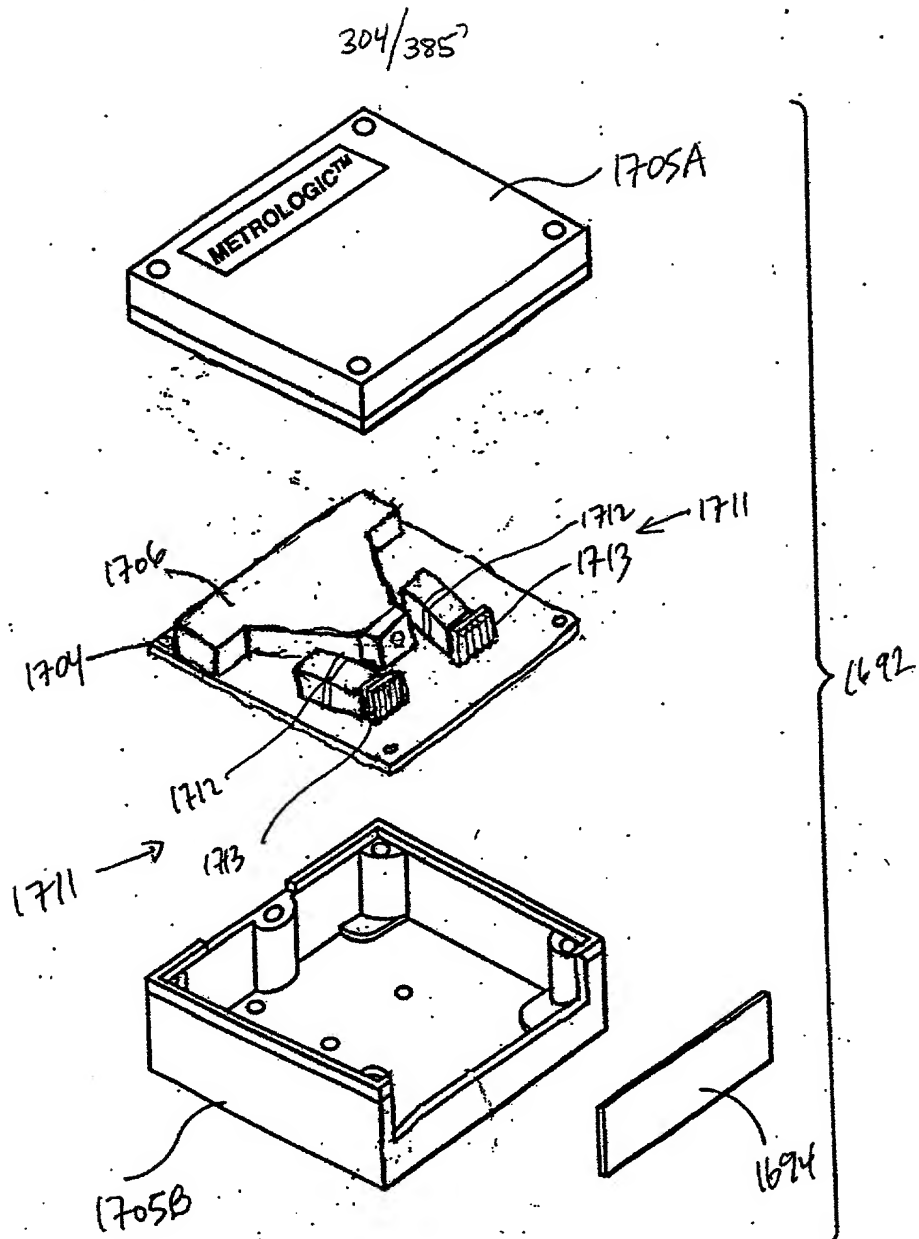


FIG. 47B

305/385

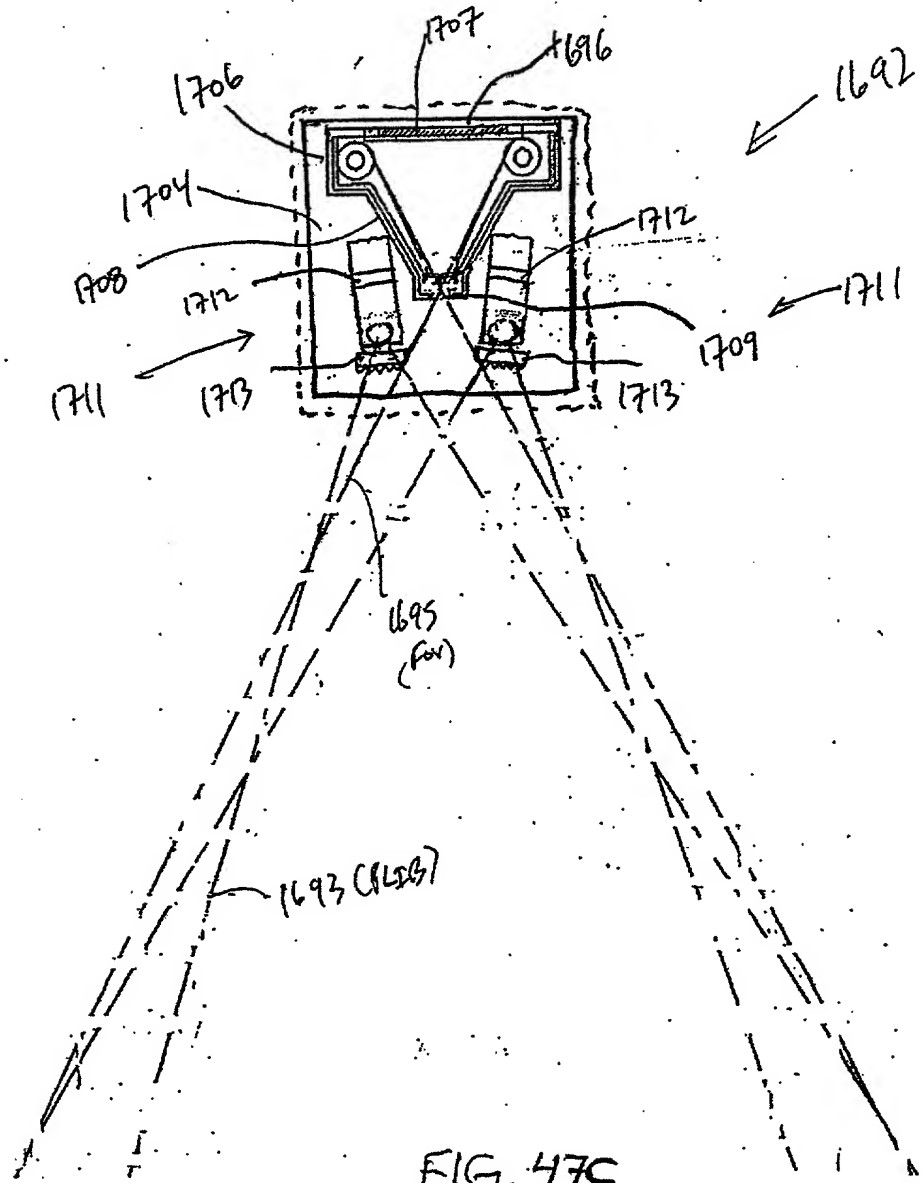


FIG. 47C

2020-23489001

306/385

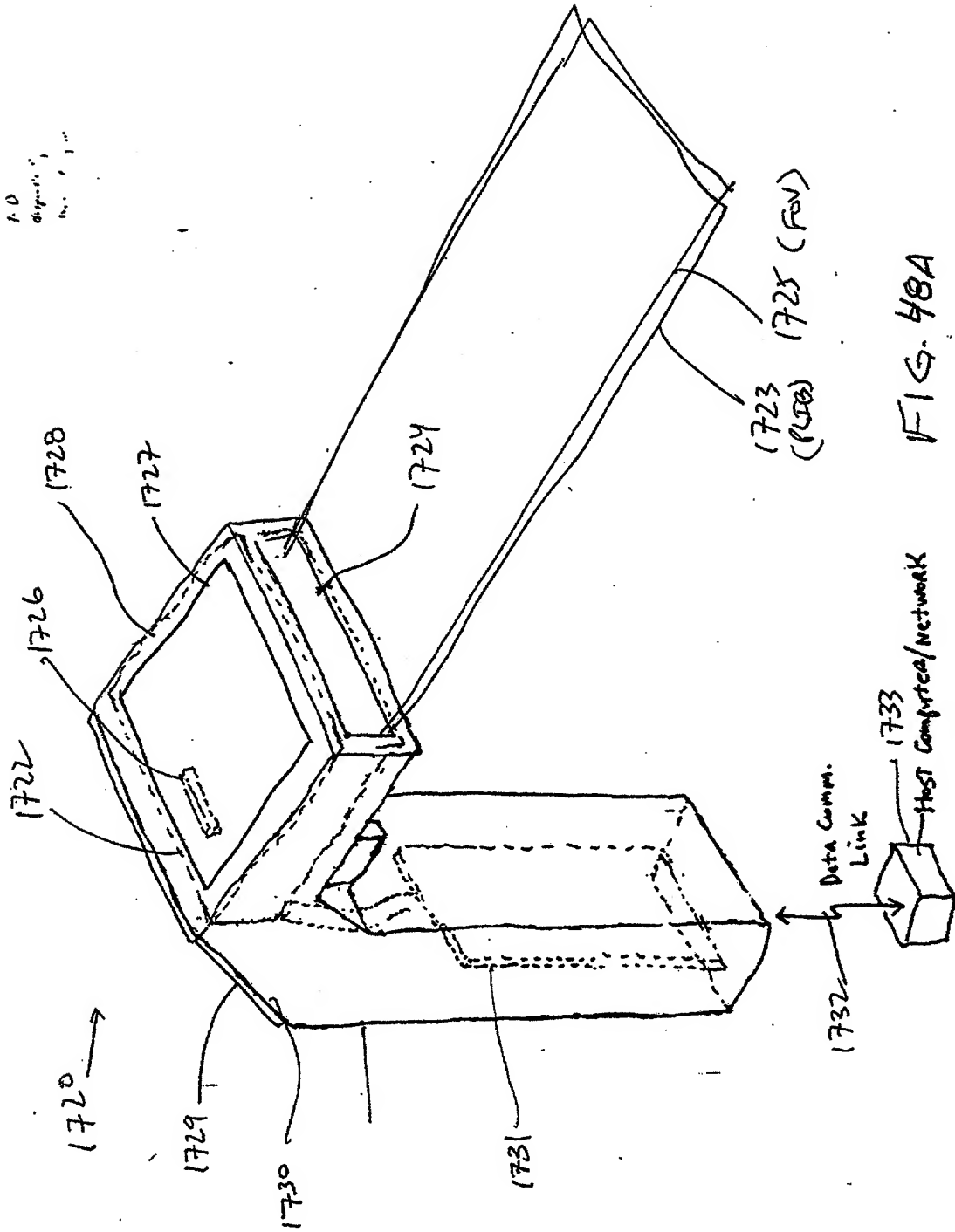


FIG. 48A



202020-29489001

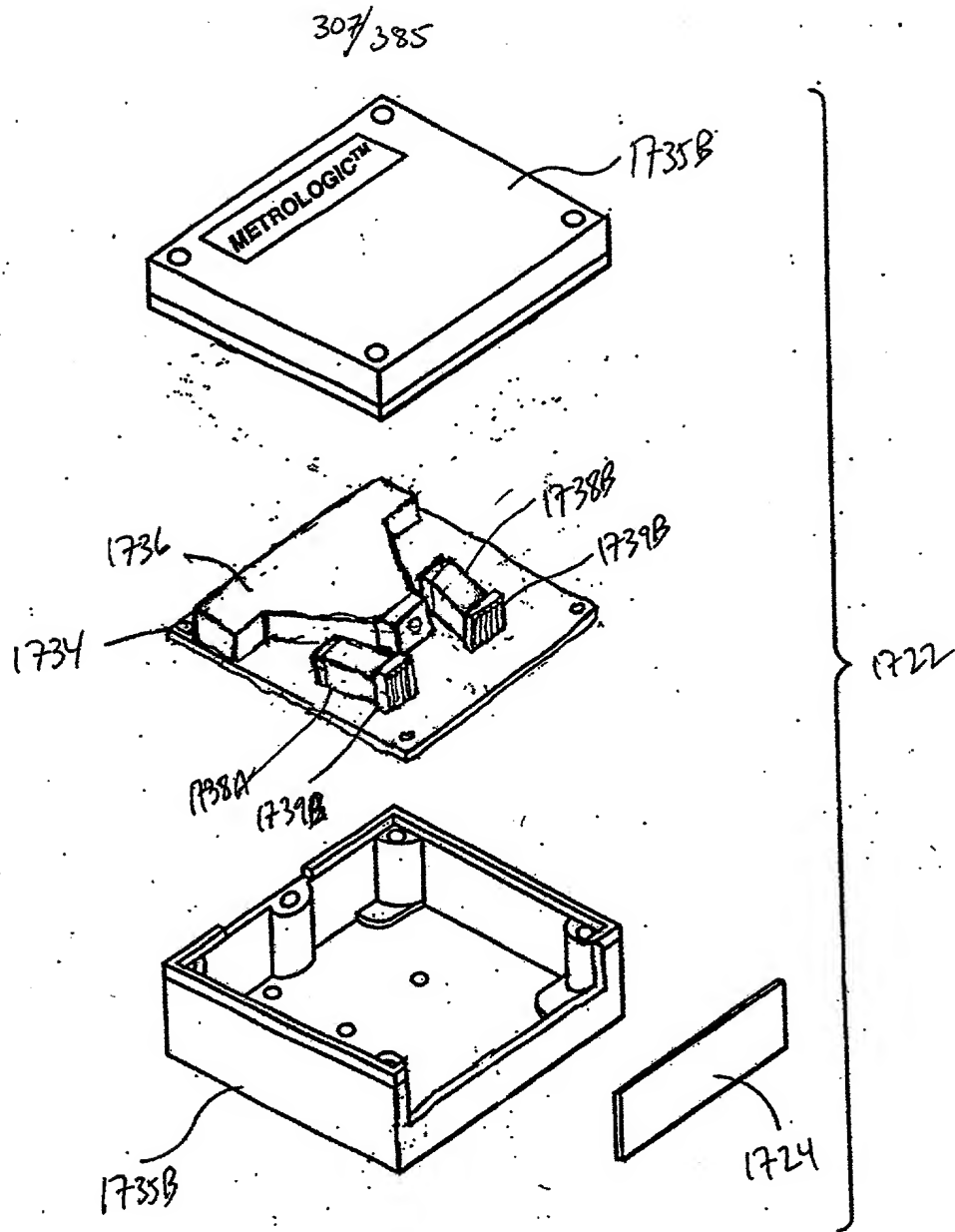


FIG. 48B

308/385

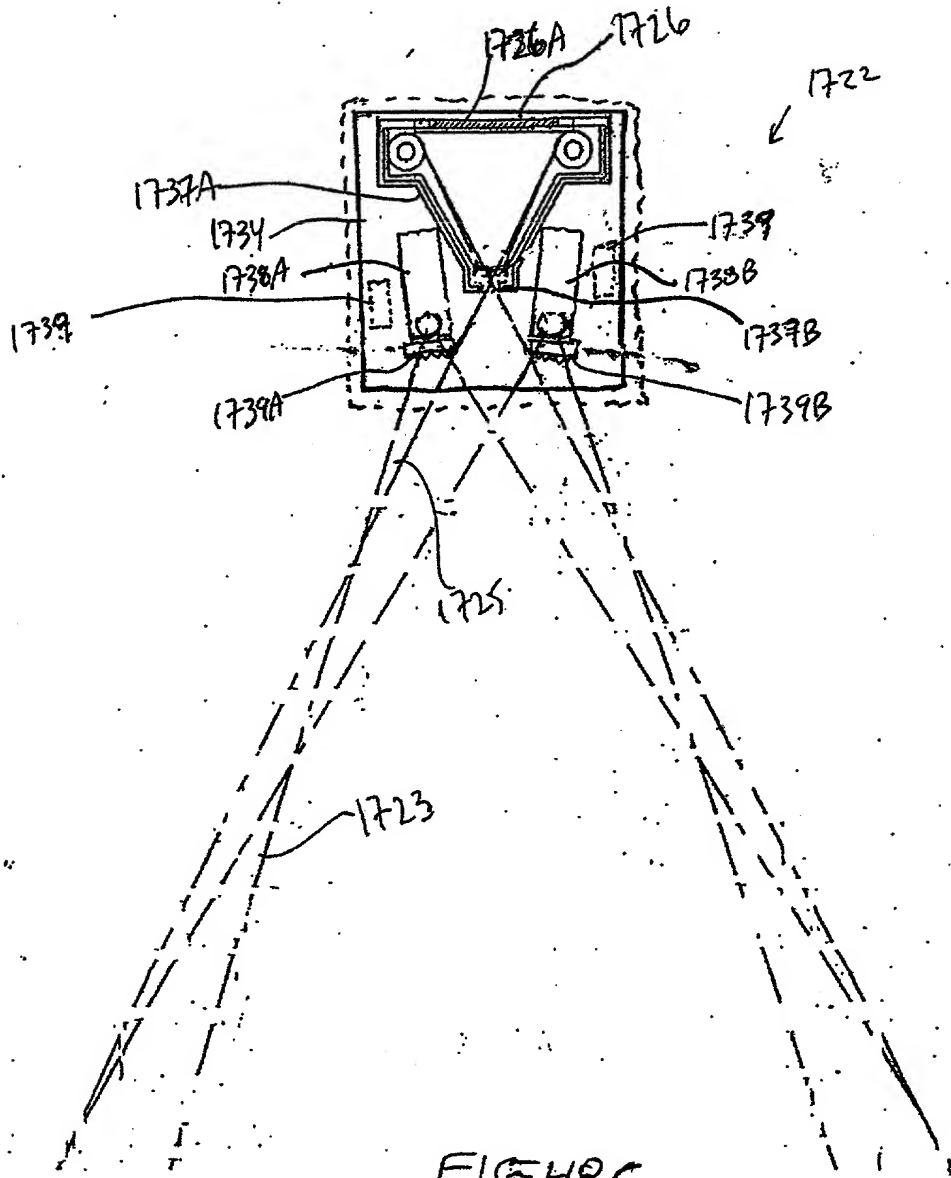


FIG. 48C

10068463.020702

1-D  
display  
area

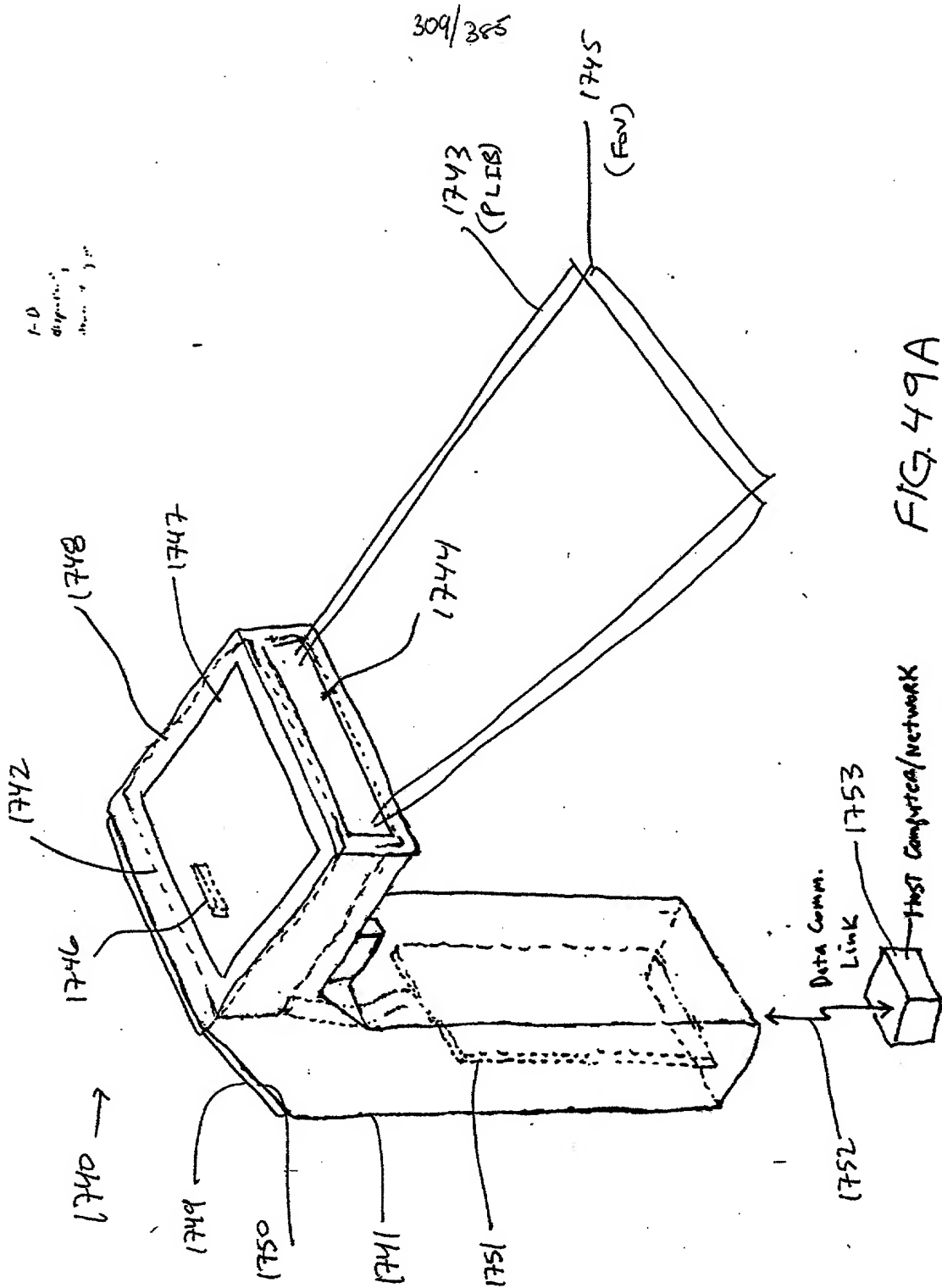


FIG. 49A

310/385

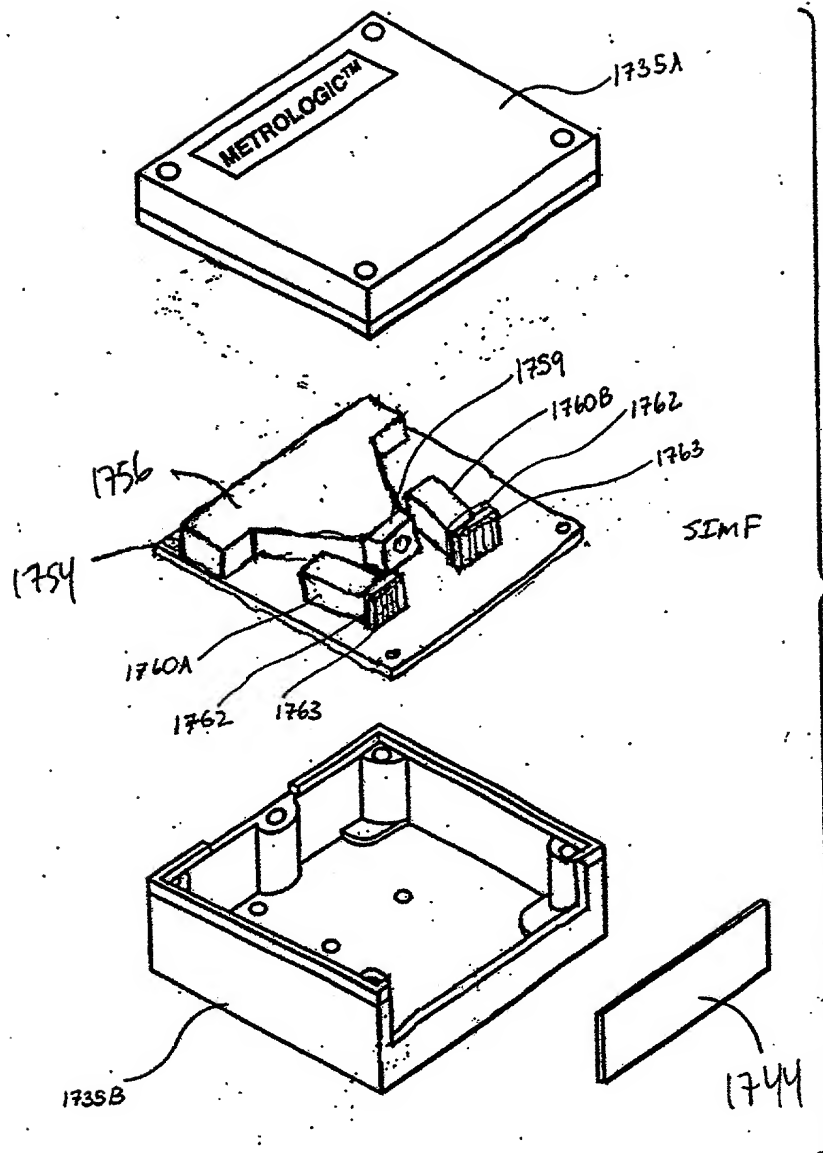


FIG. 49B

(311/385)

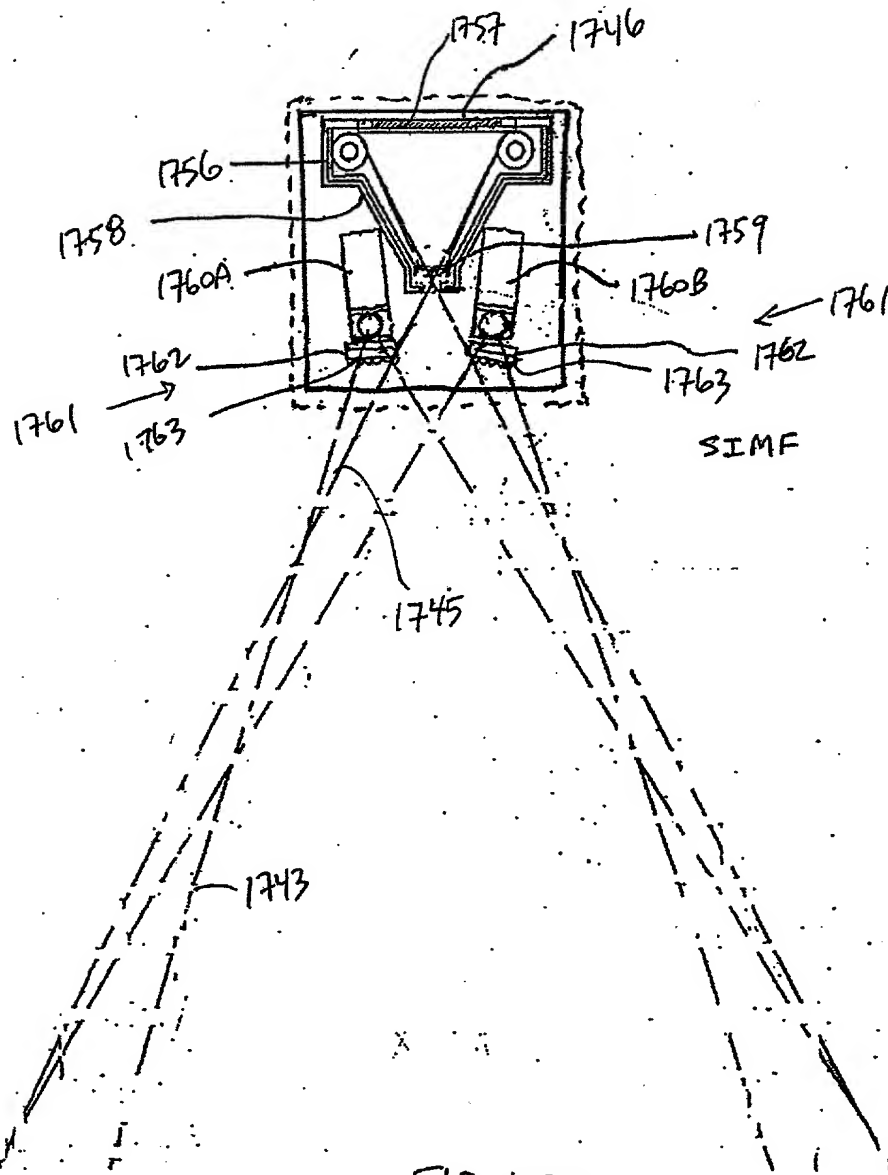


FIG. 49C

10058462.020702



2020201 29489001

313/ 385

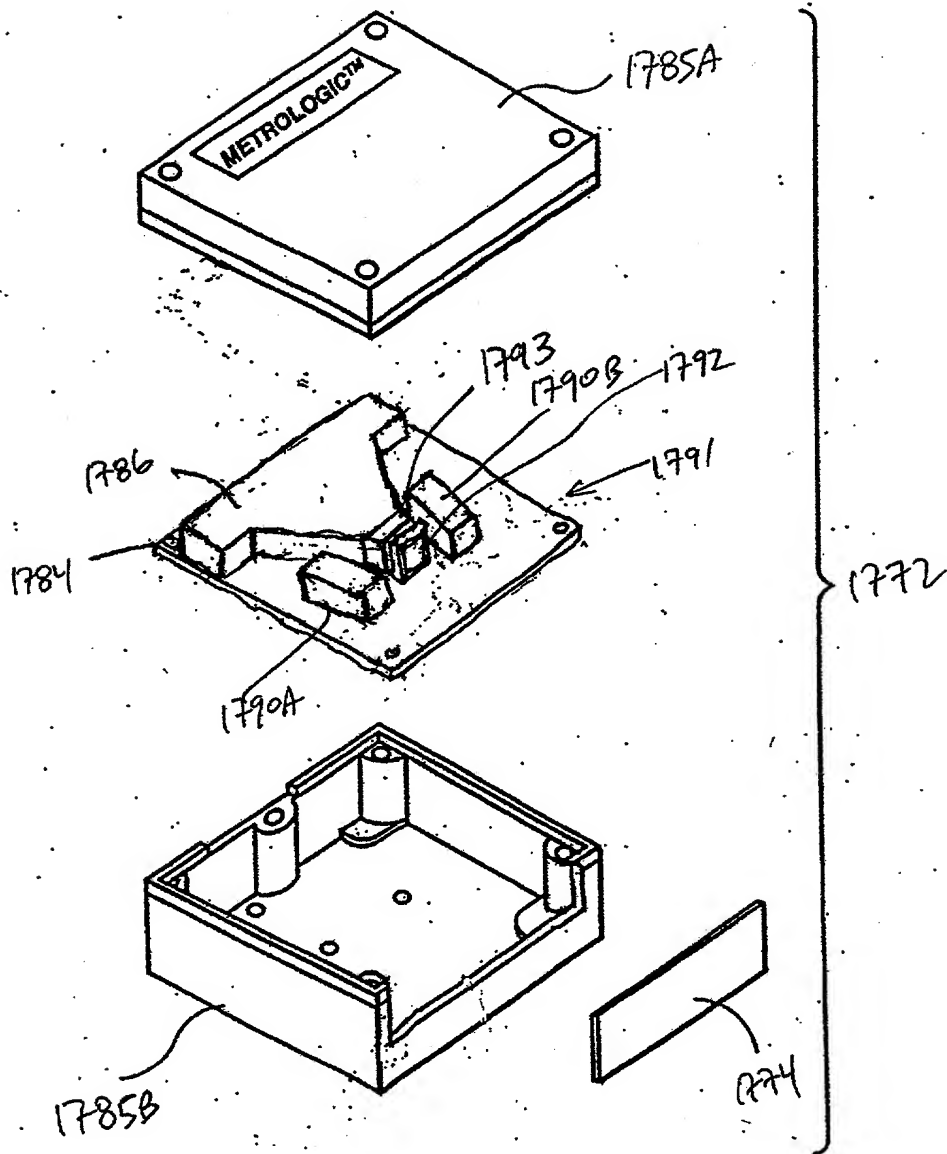


FIG. 50B

314/385

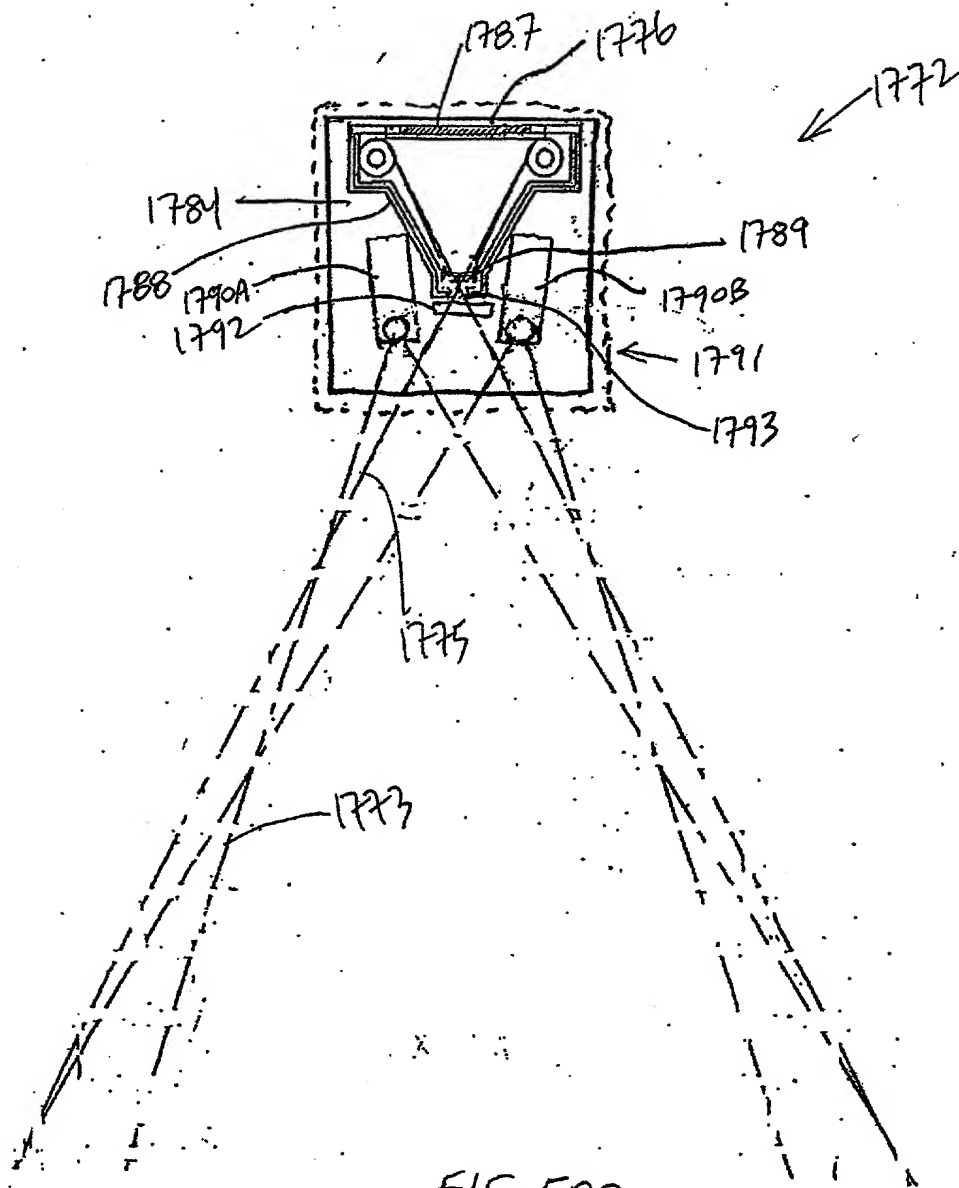


FIG. 50C

202020 29485001



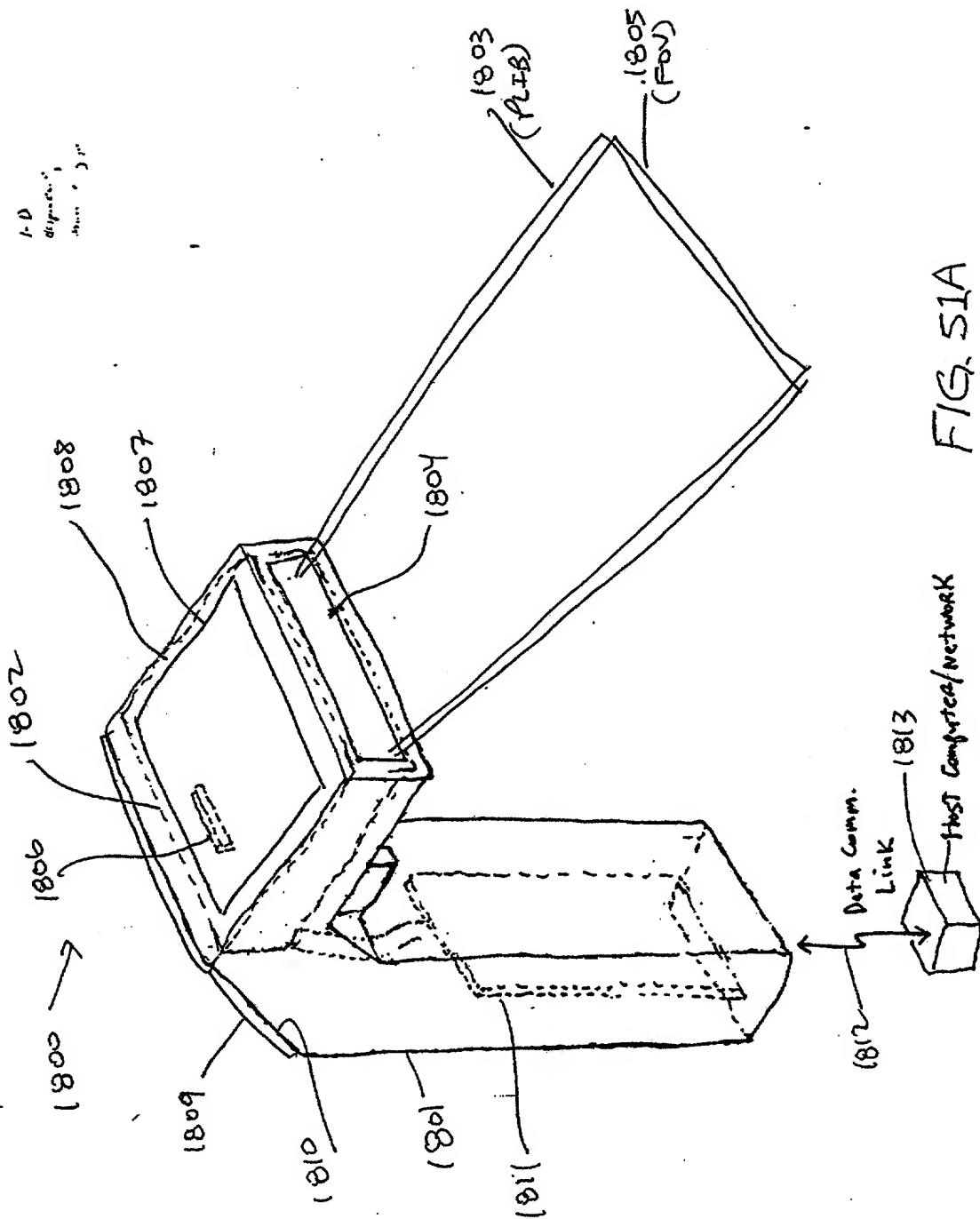


FIG. 51A

10063443.020702

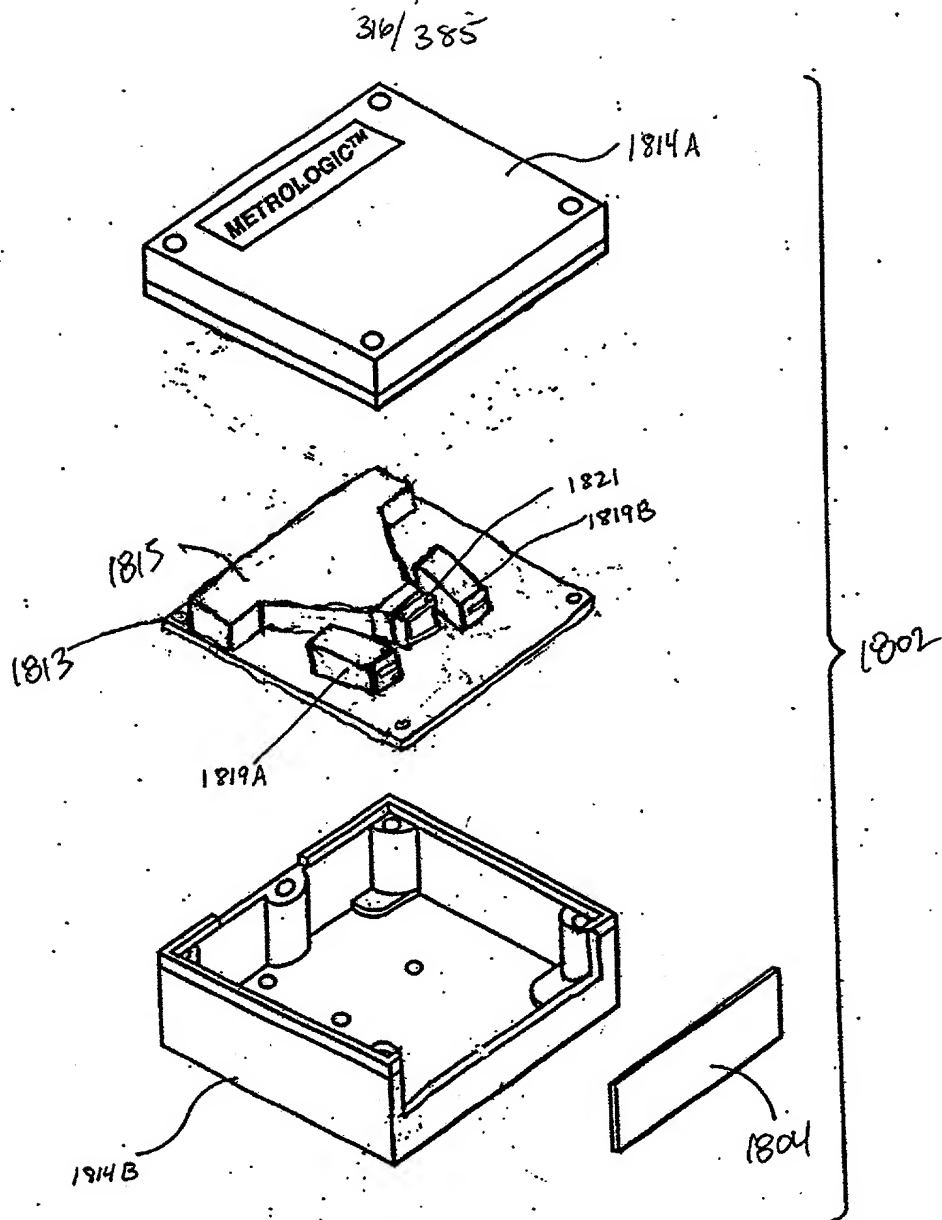


FIG. 51B

317/385

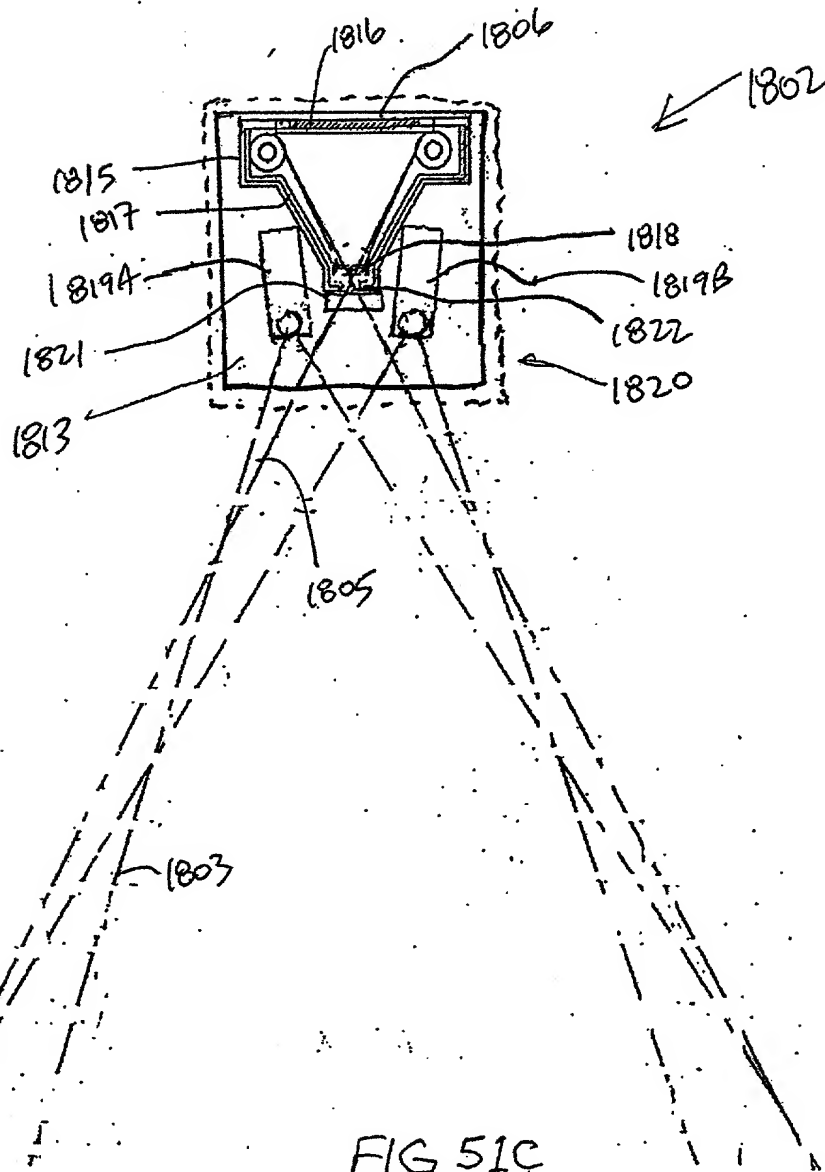


FIG. 51C

10068463, 020702



319/385

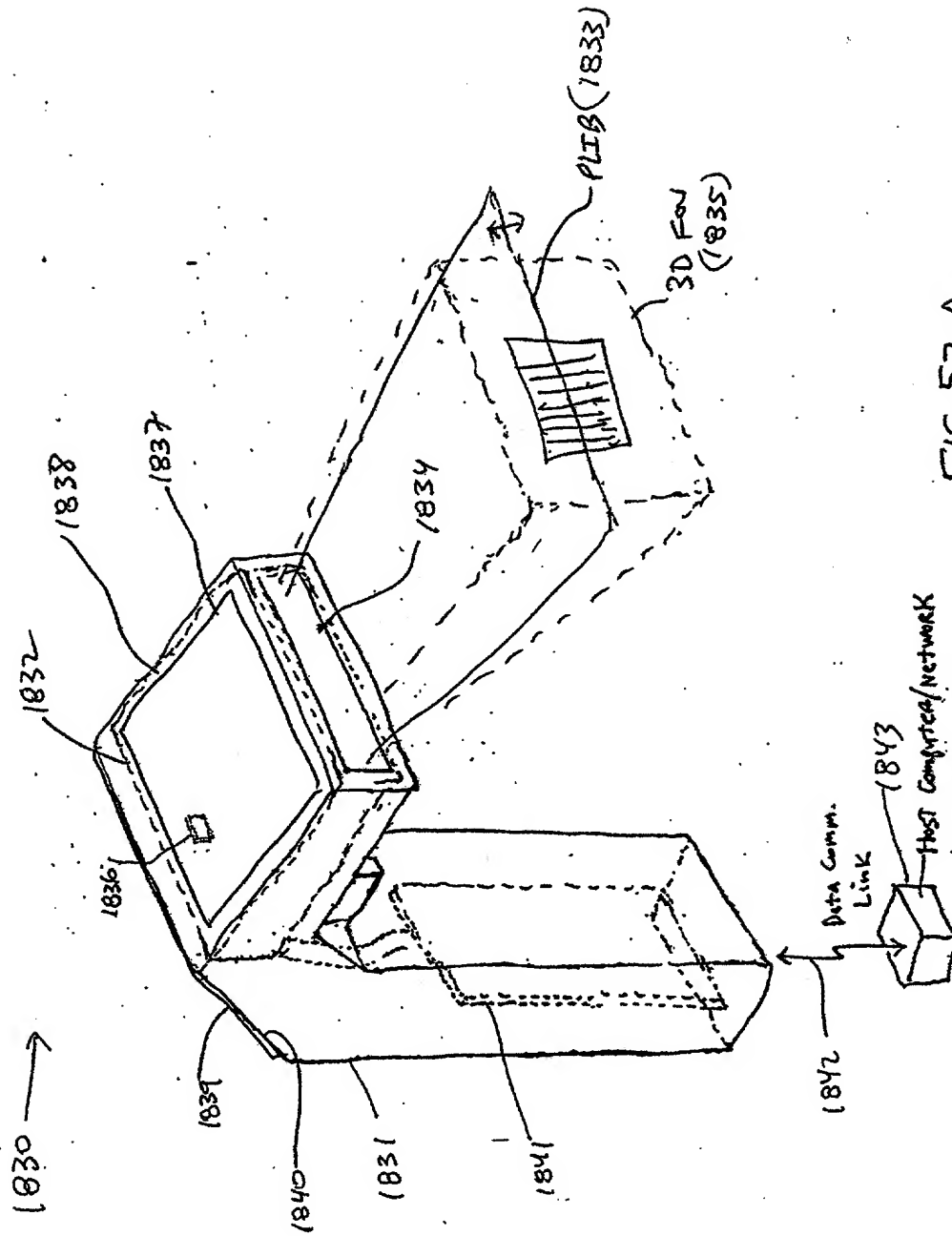


FIG. 52A

10058462.020702

320/385

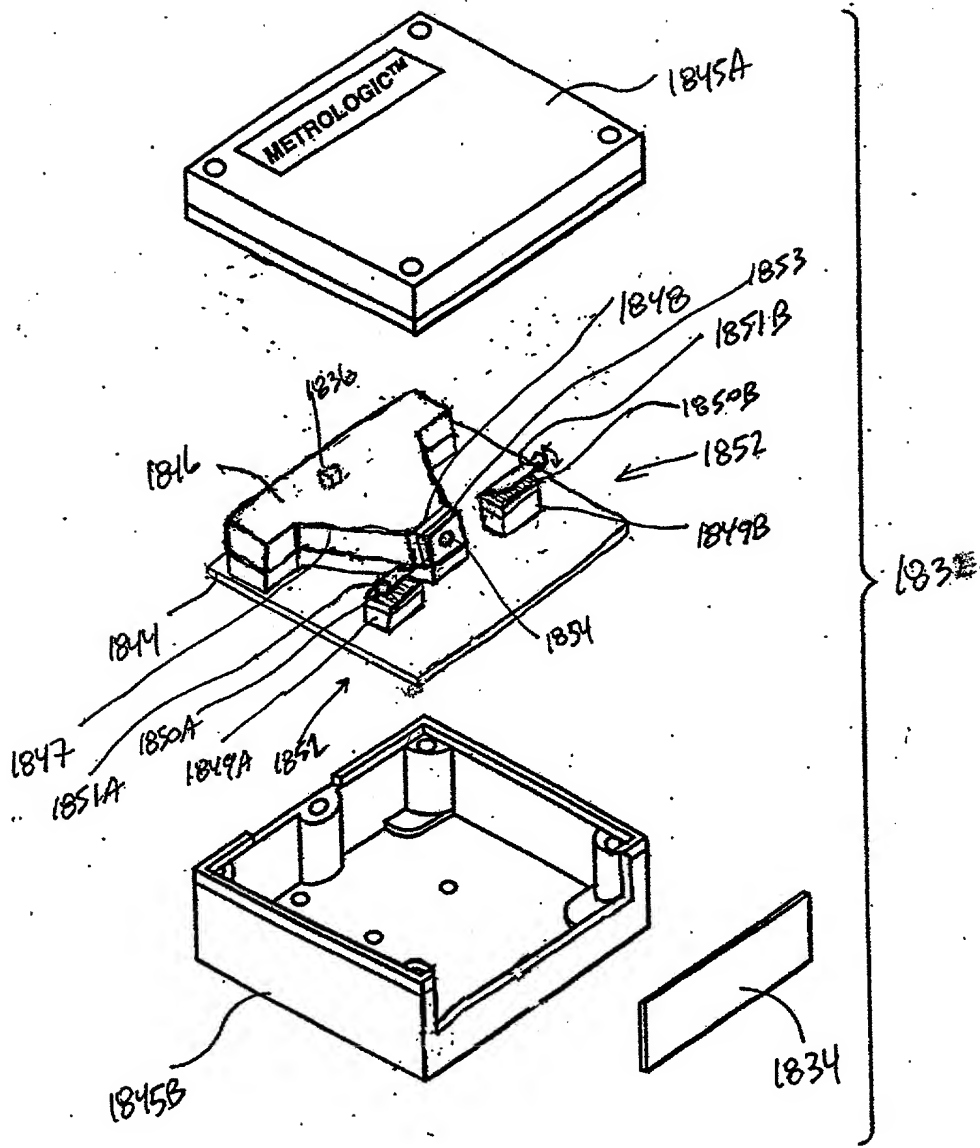
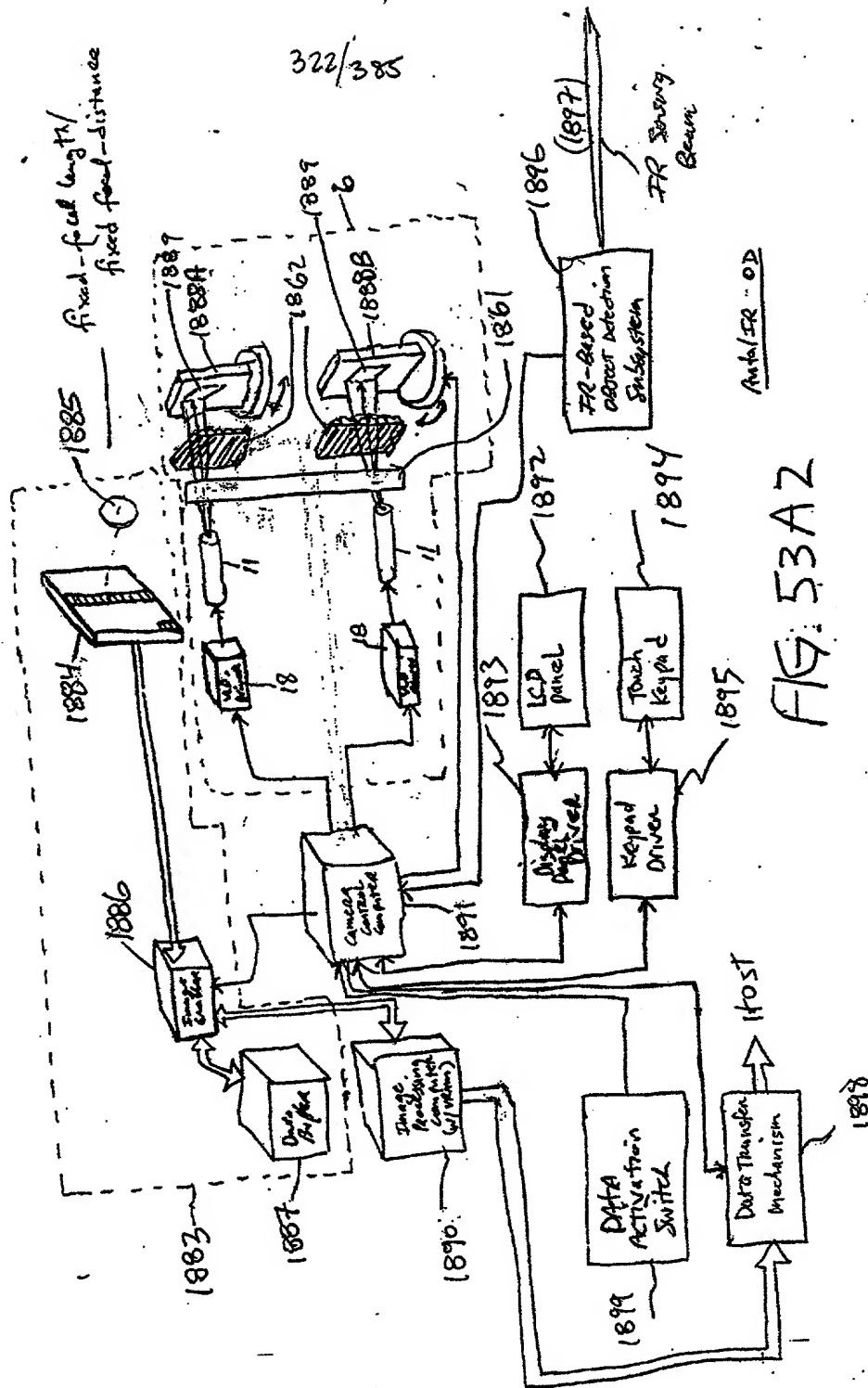


FIG. 52B

Fig. 1I 3A-3B

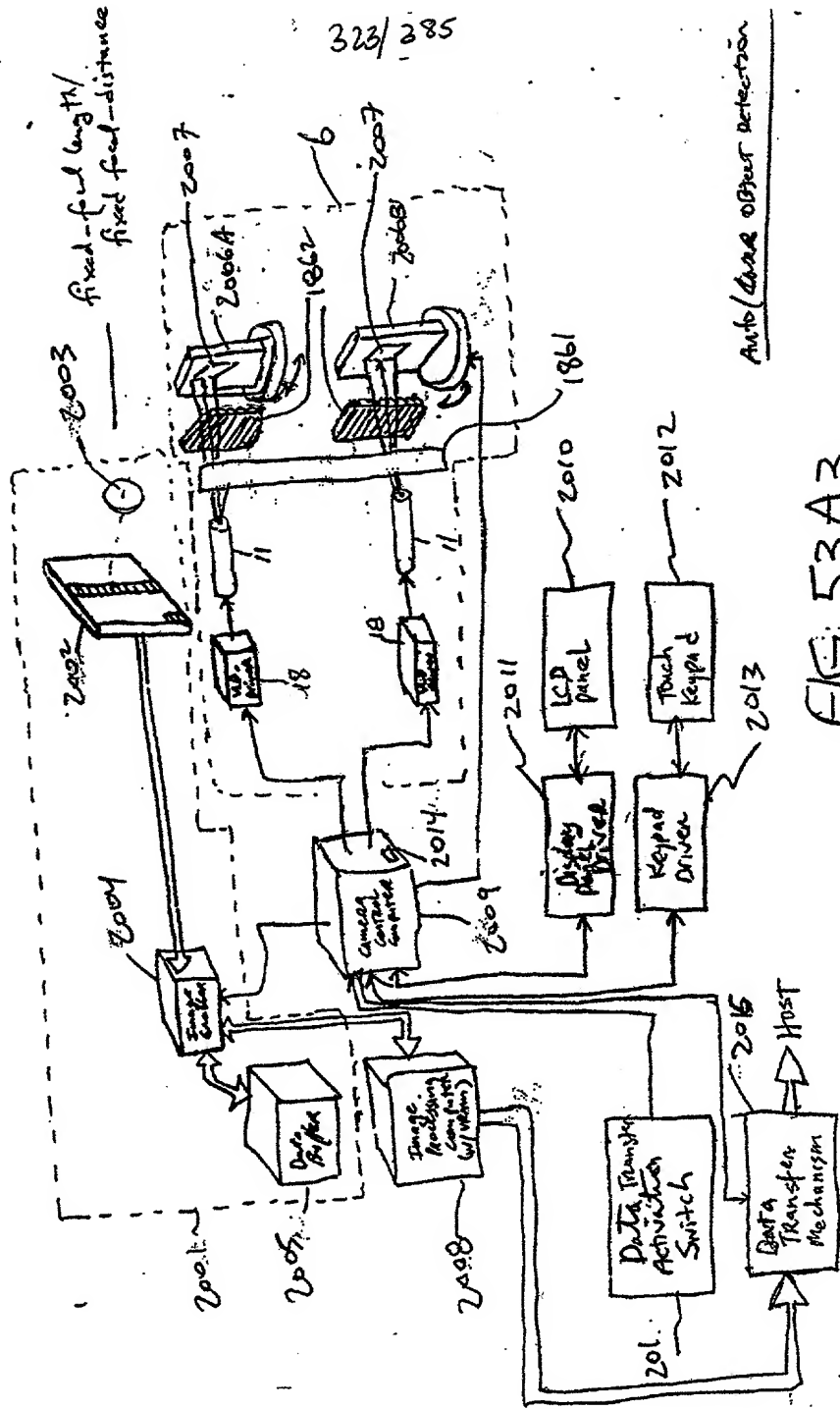


1880

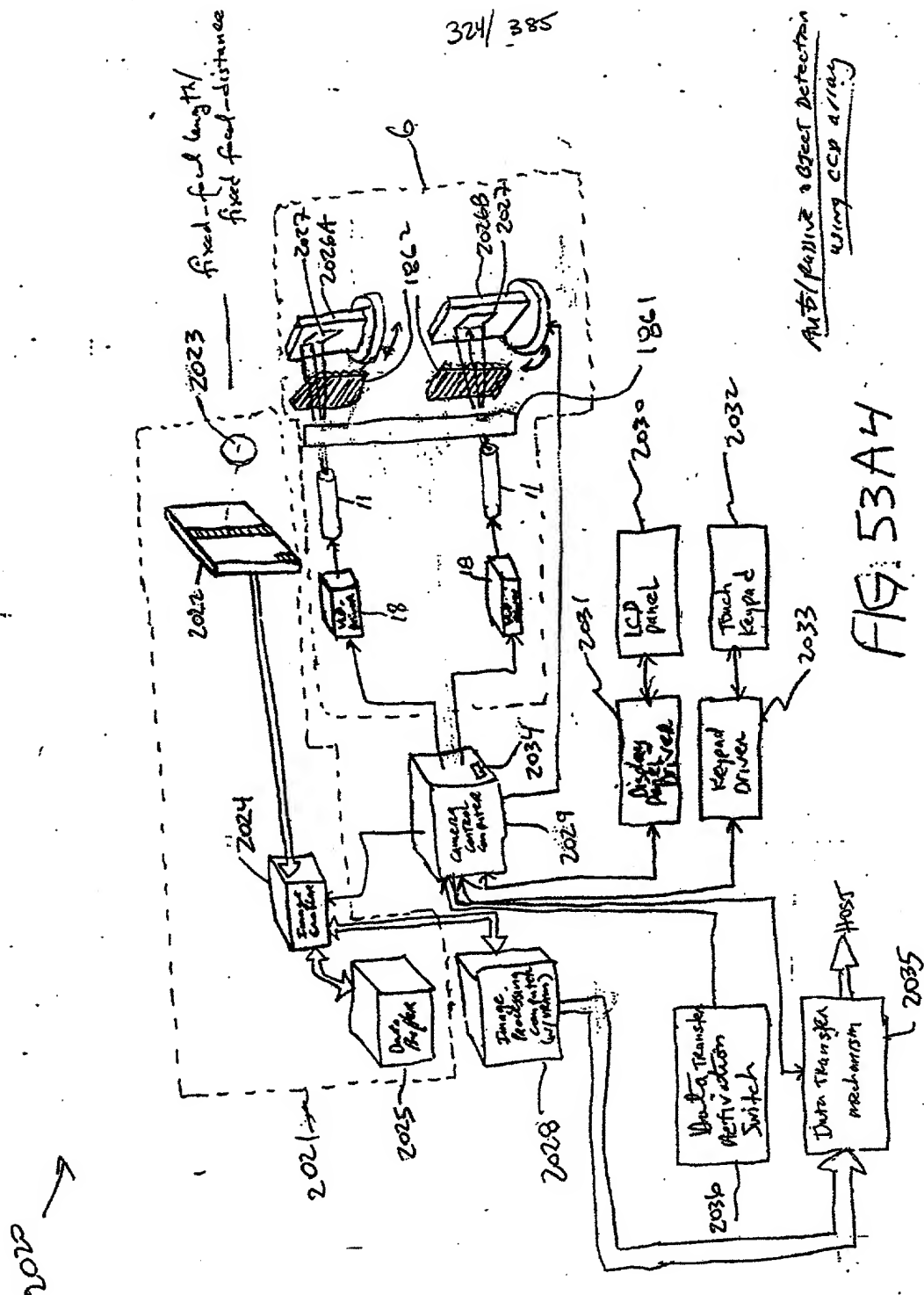




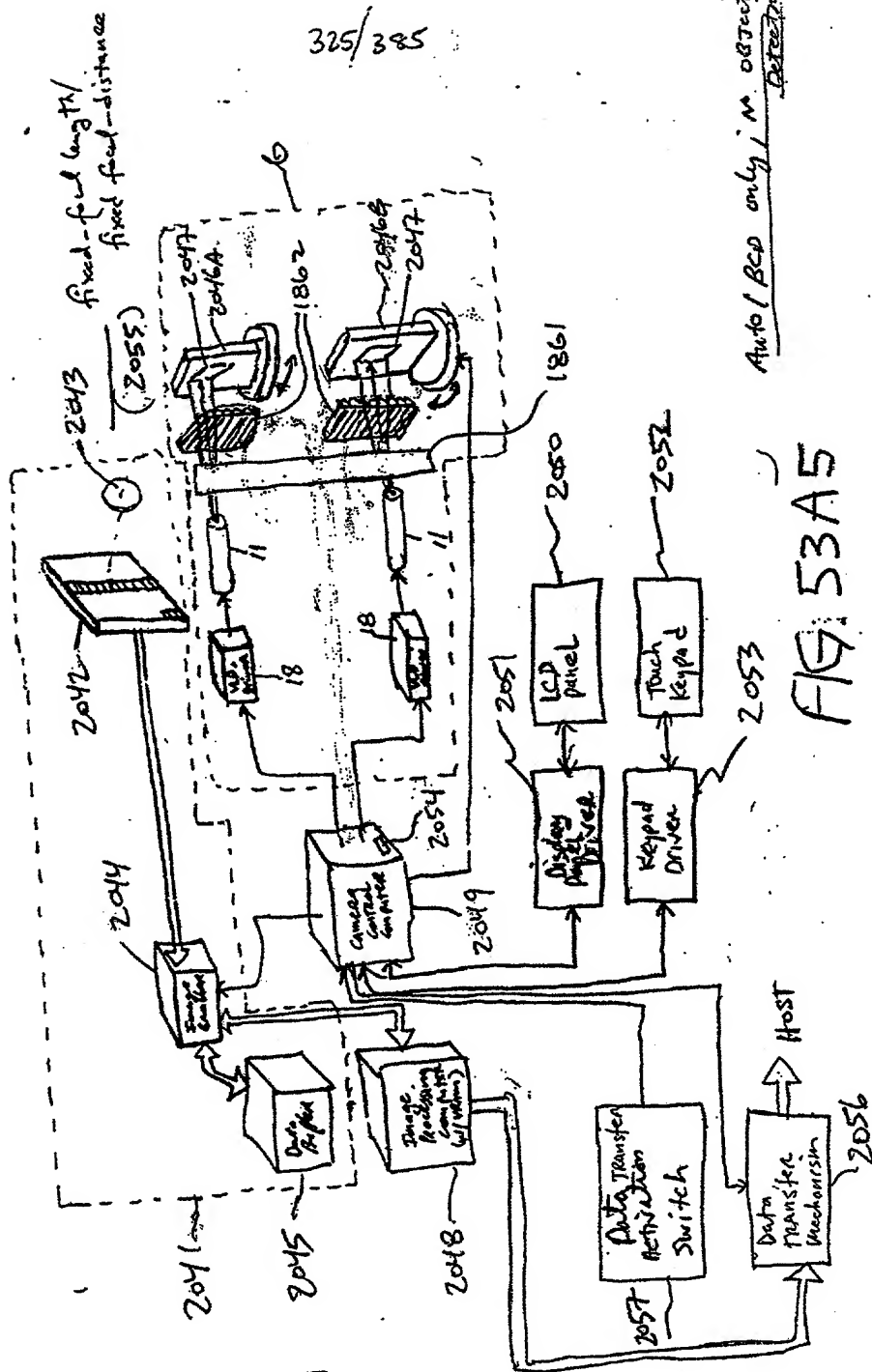
2000



THE UNIVERSITY OF CHICAGO



2040

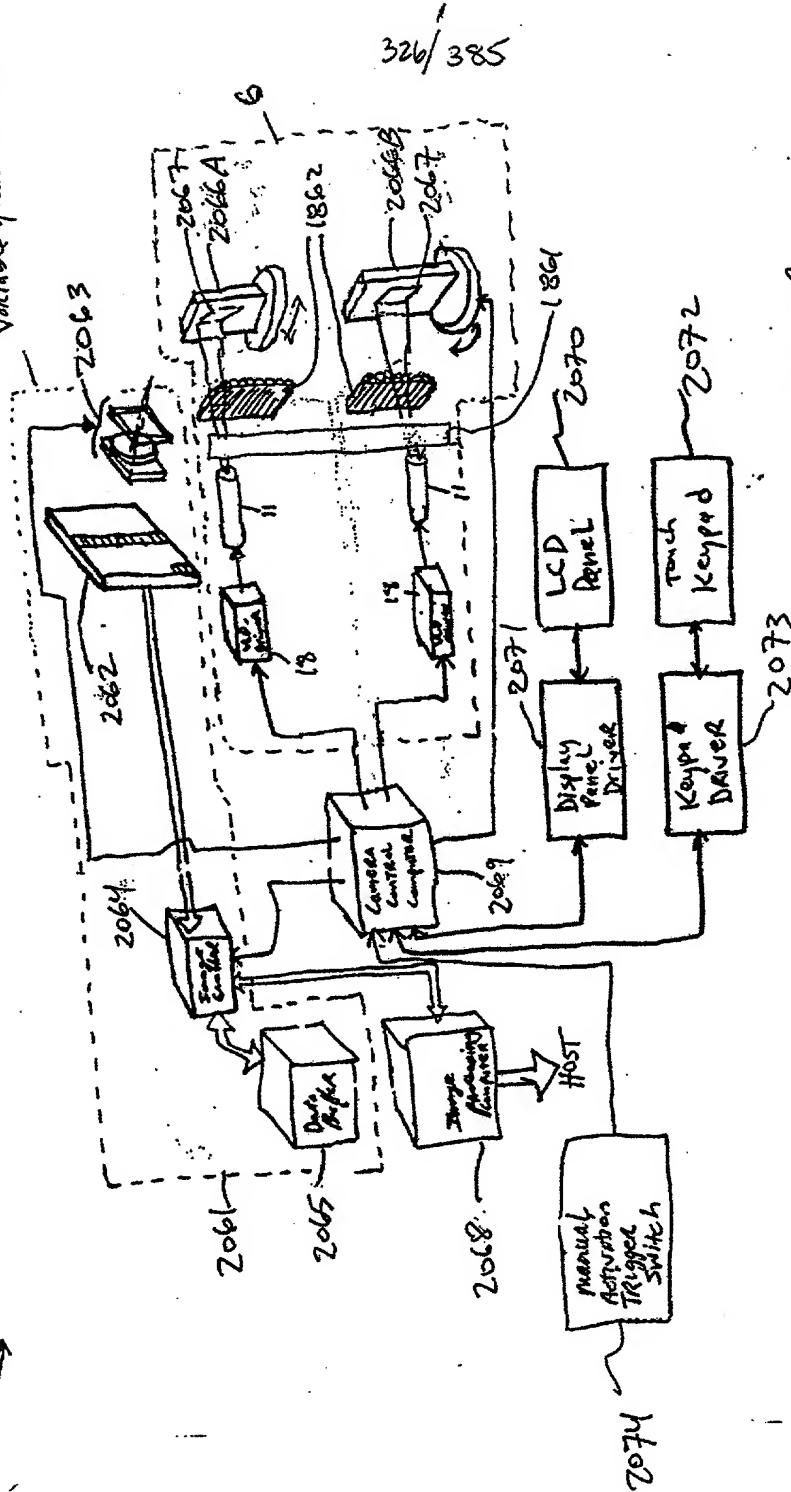


Auto / Bed only / No object detection

FIG. 53A5

fixed focal length/  
variable focal distance

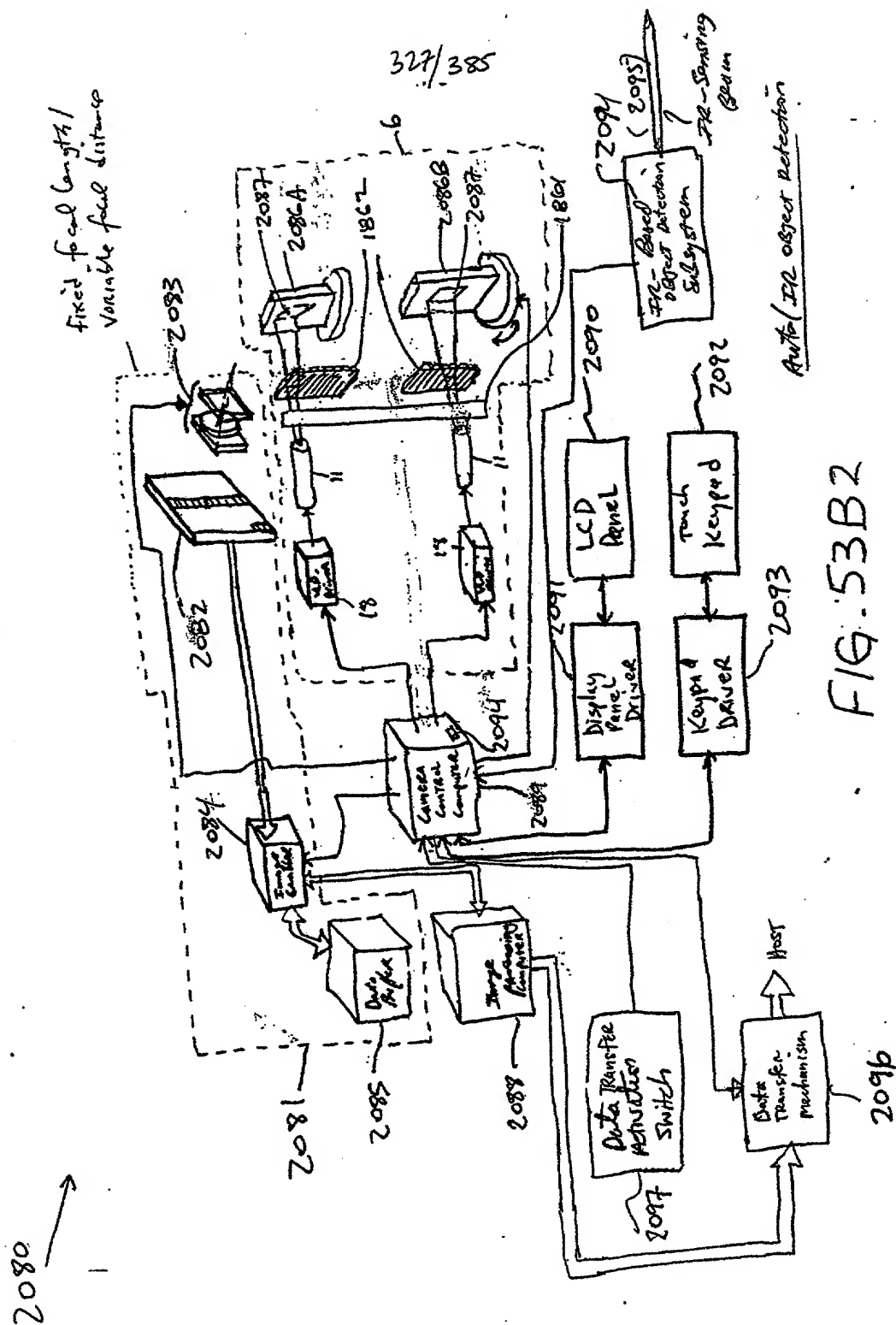
2060 →

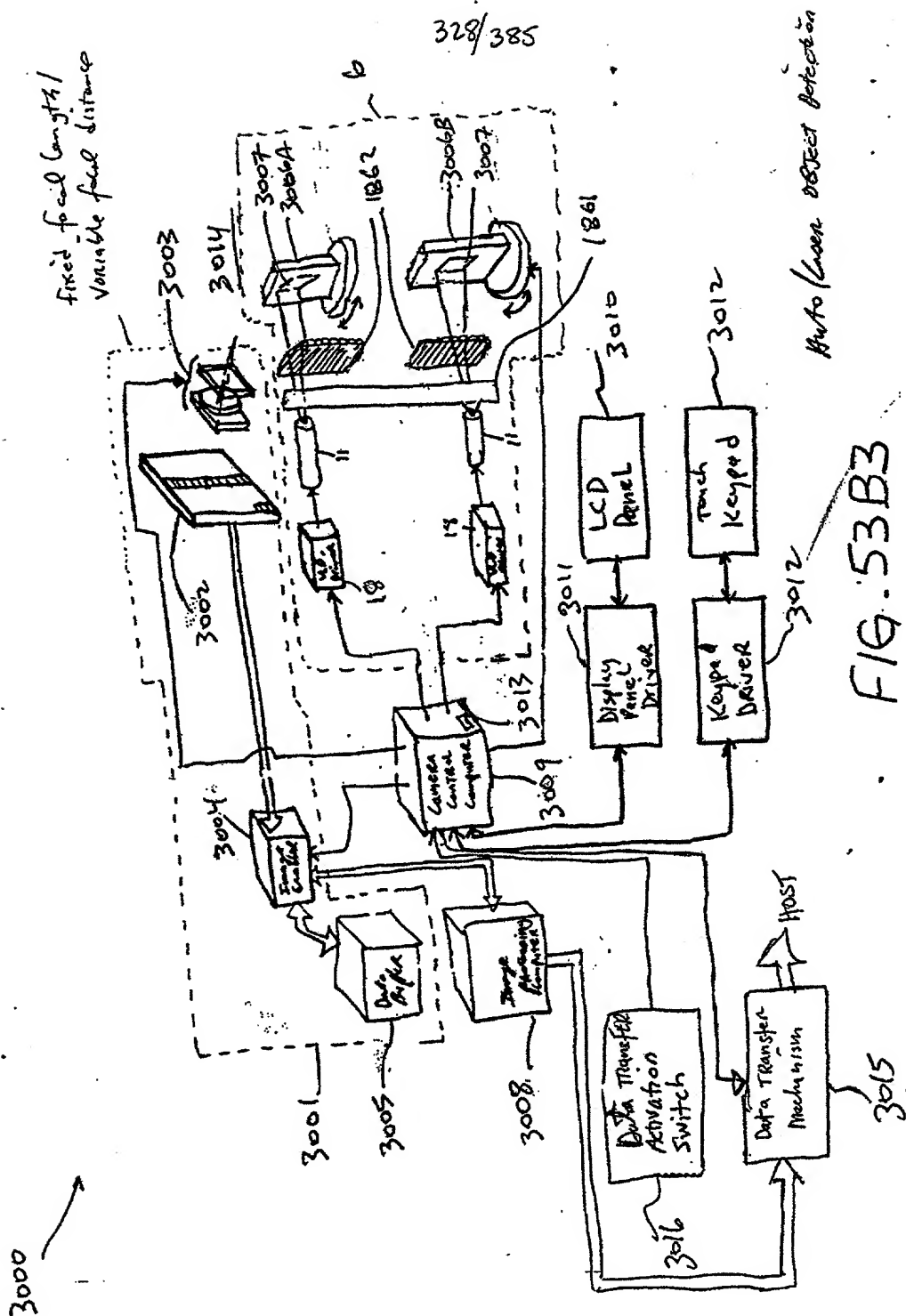


Manual

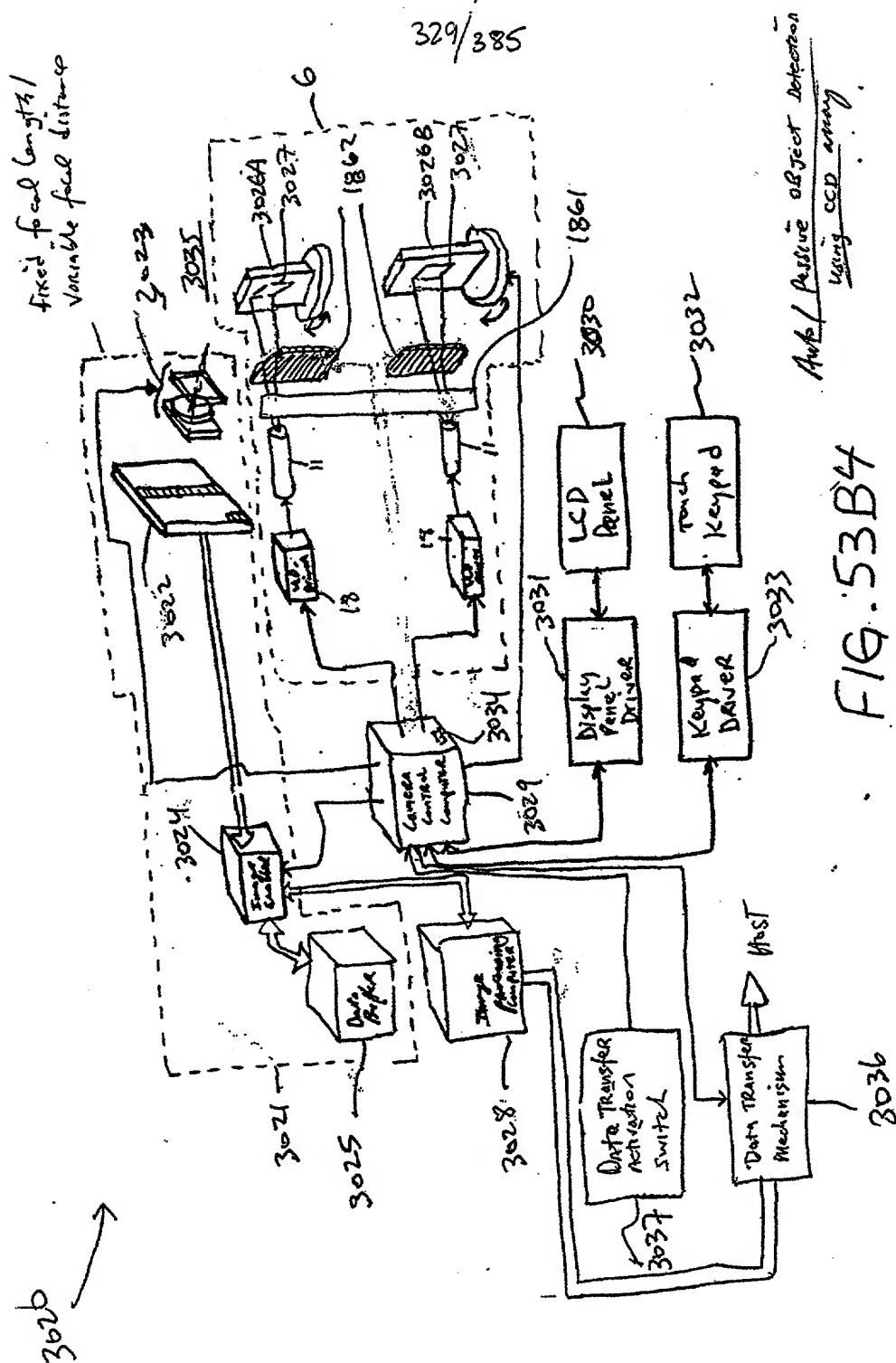
FIG. 53B1

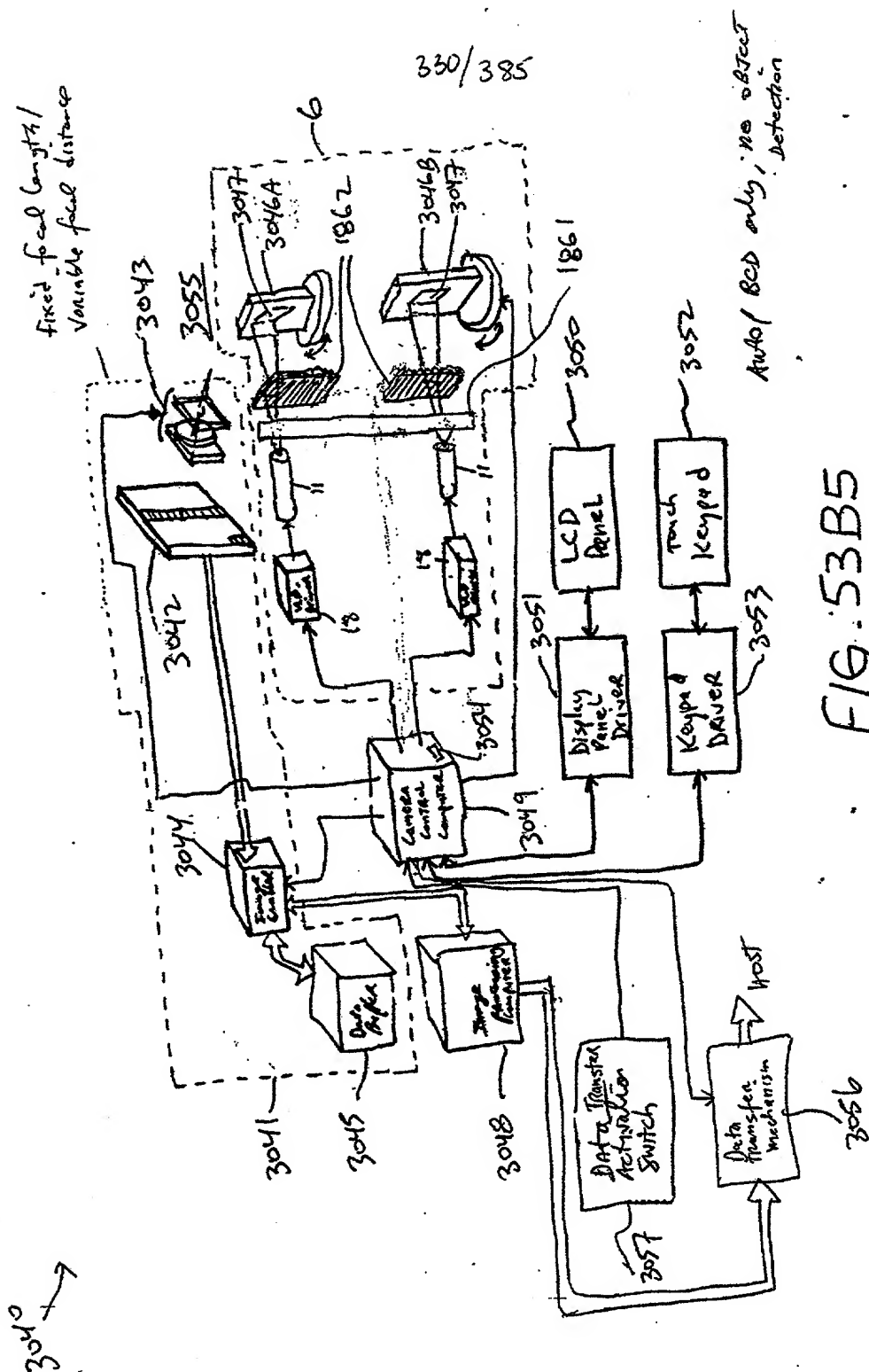
**WITNESSES:**





30 SEP 1993

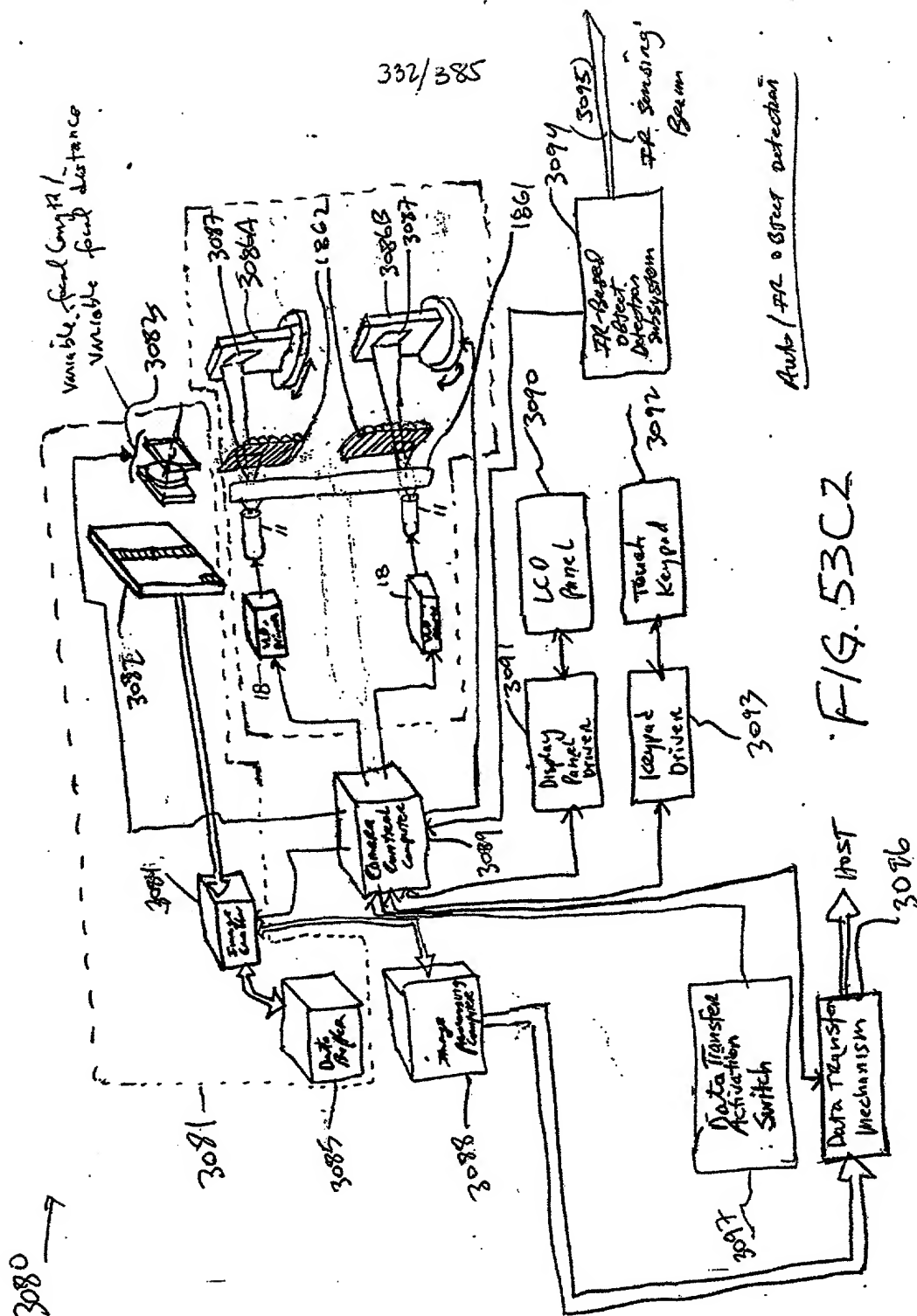






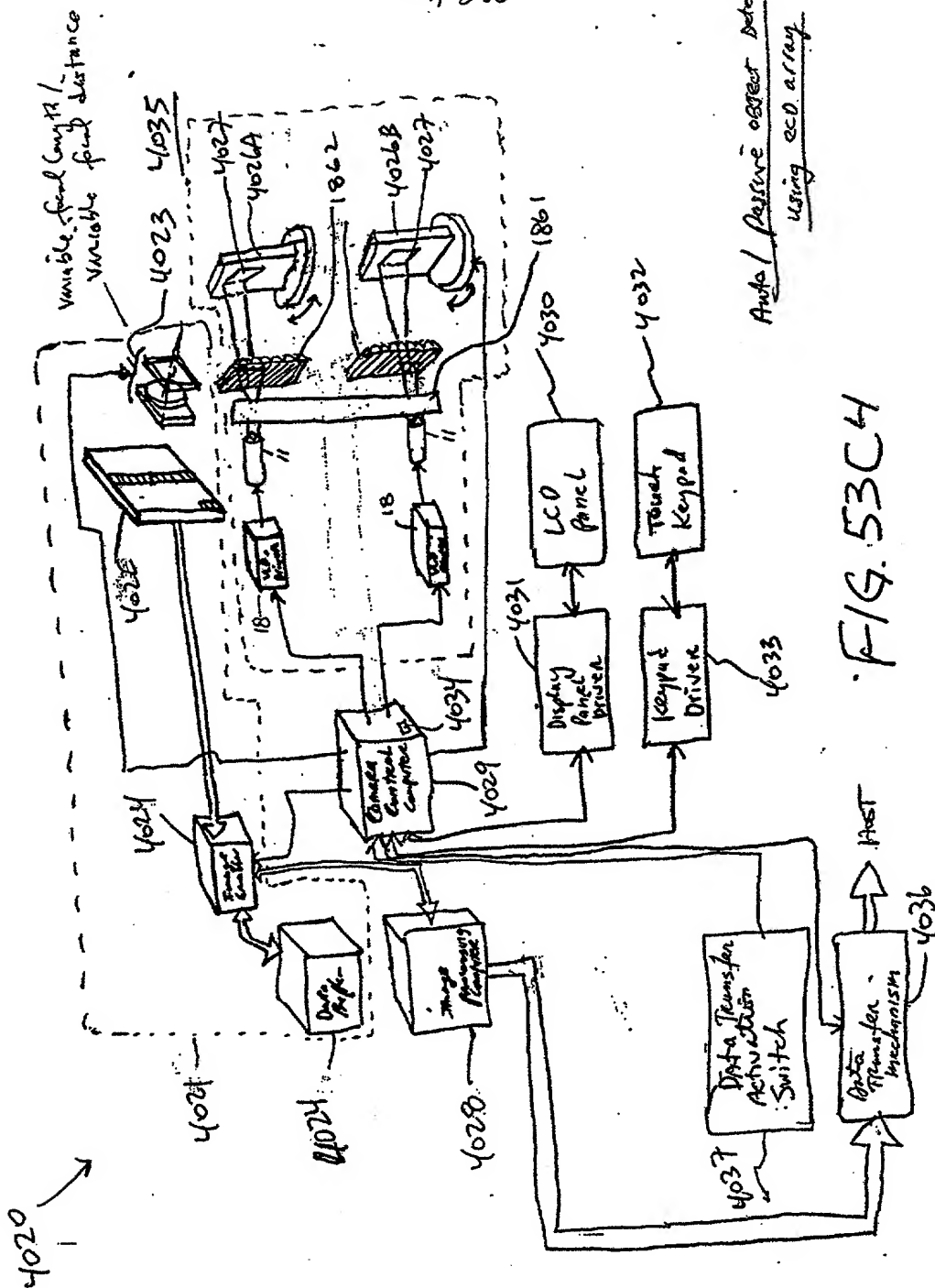


**SECRET**





334/385



Auto / Passive object detection  
using ECD array

FIG. 53C4

335/385

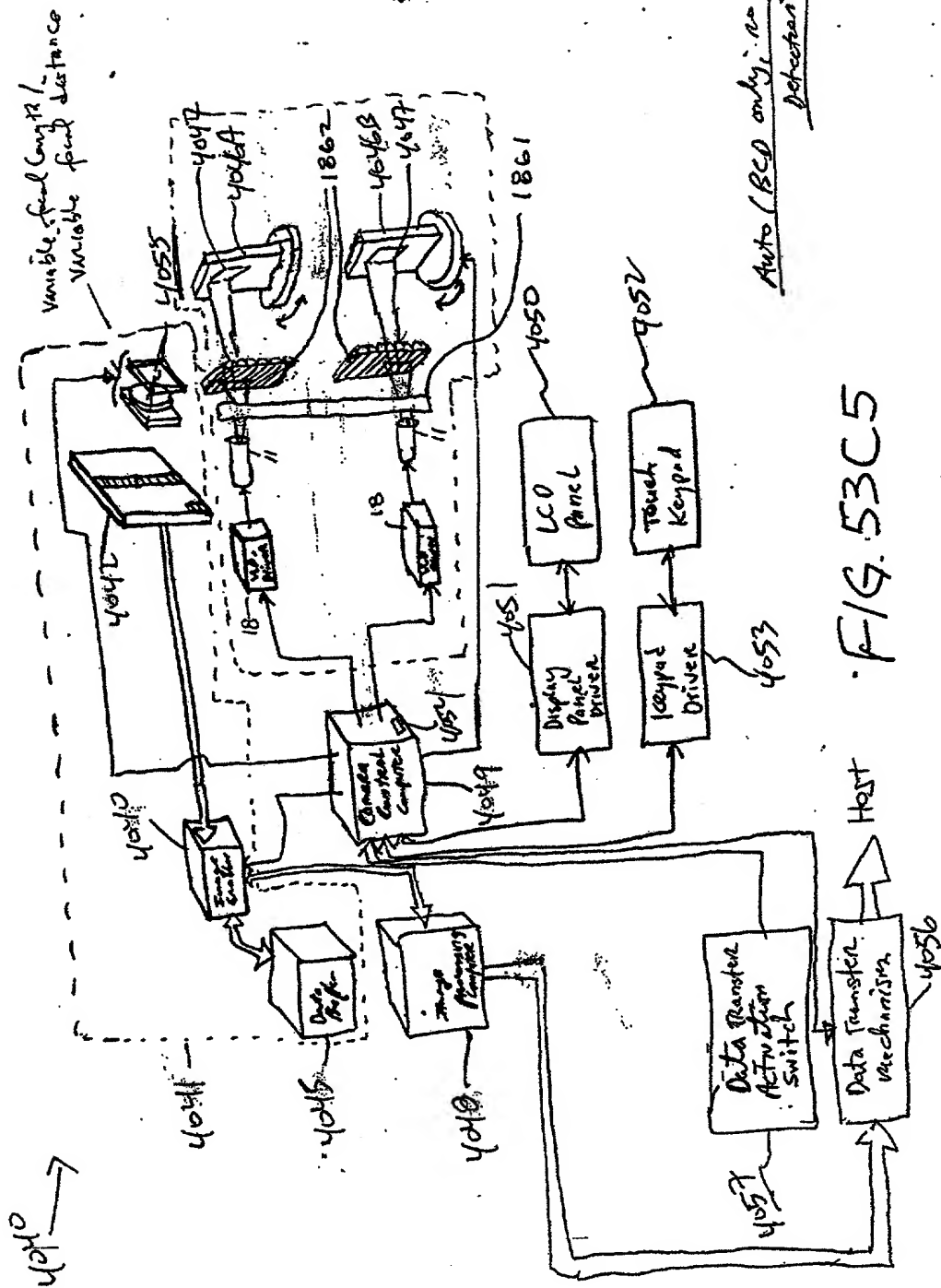


FIG. 53C5

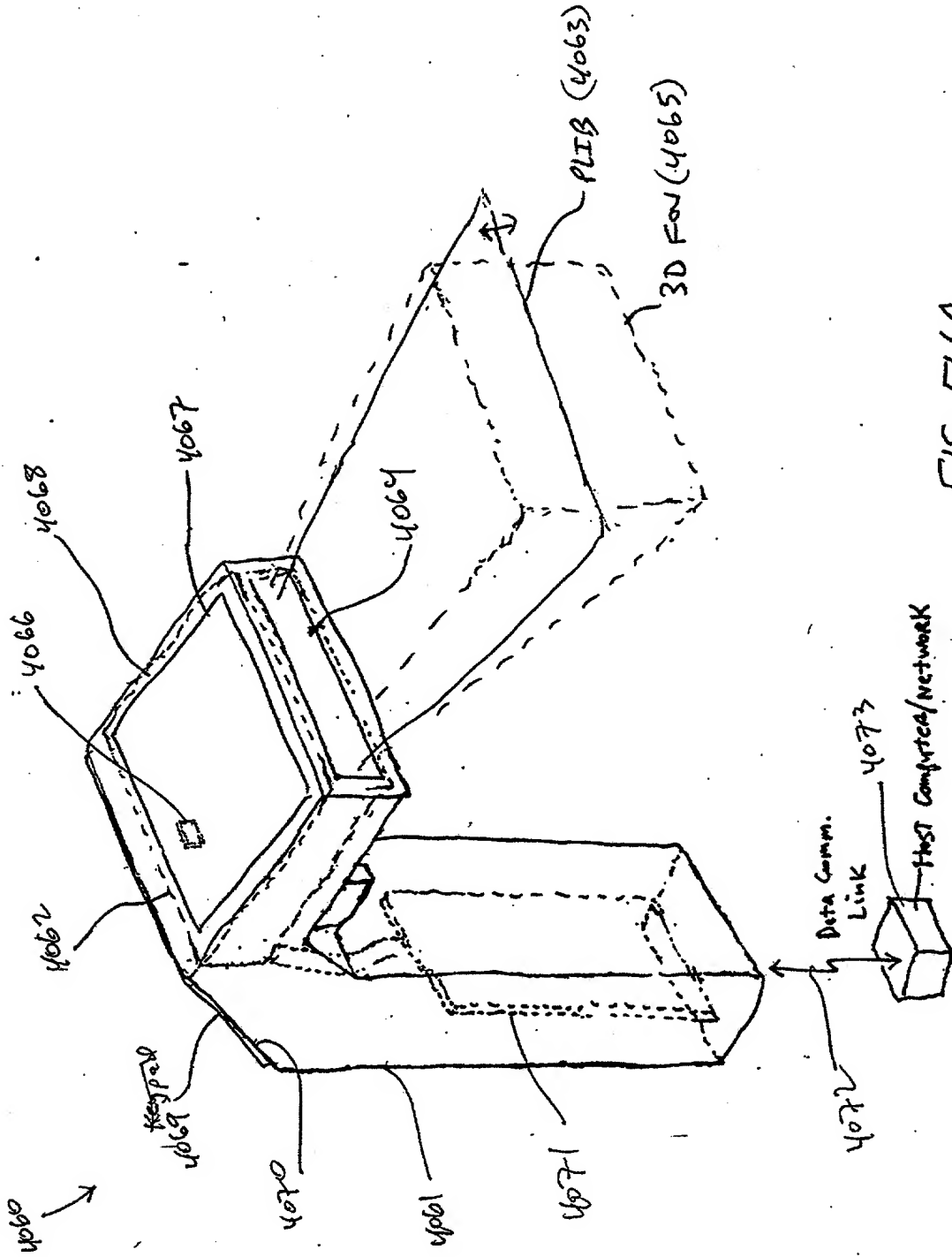


FIG. 54A

337/385

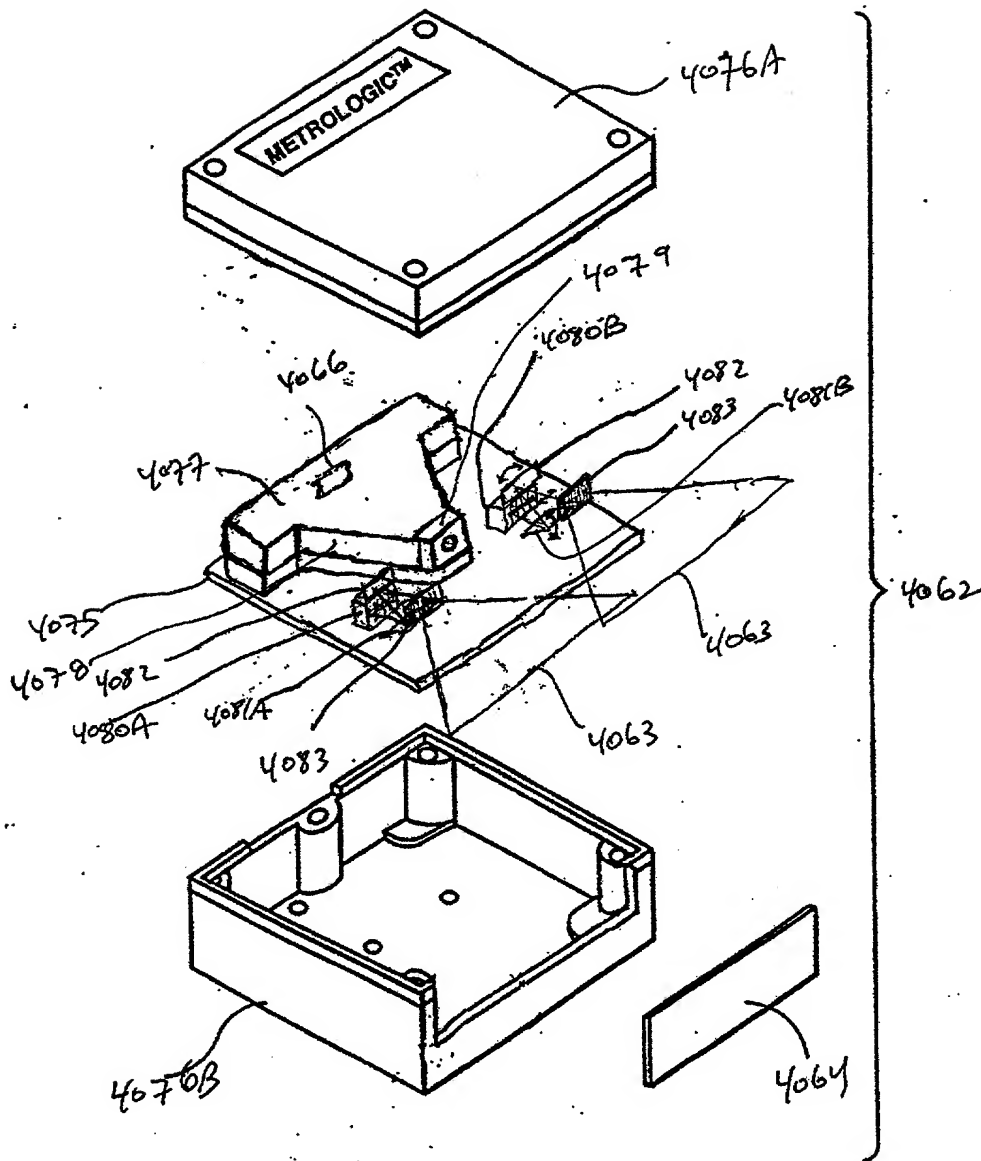


FIG. 54B

(dual micro)

Fig. 175A-SP

1006462.020702

338/385

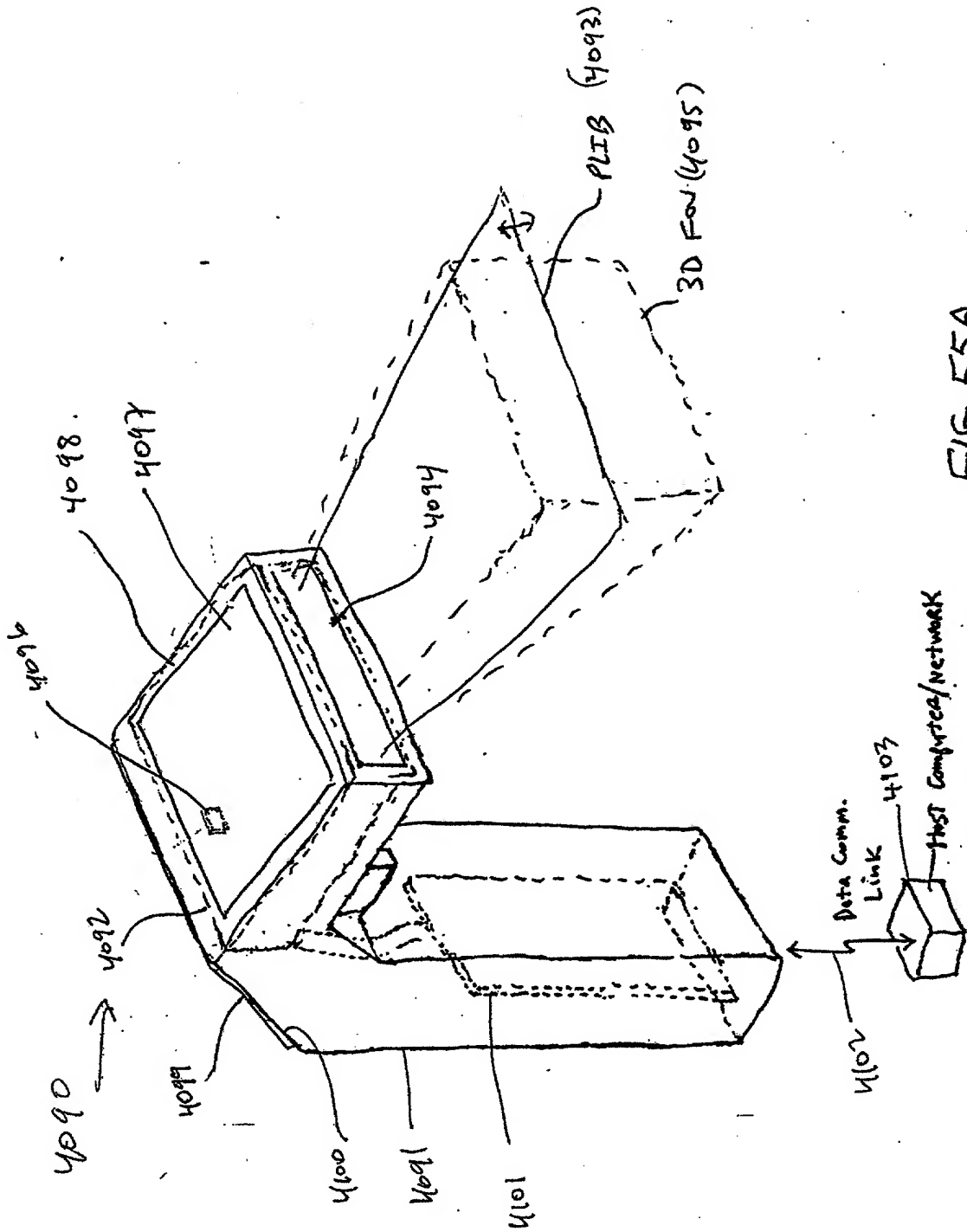


FIG. 55A



339/385

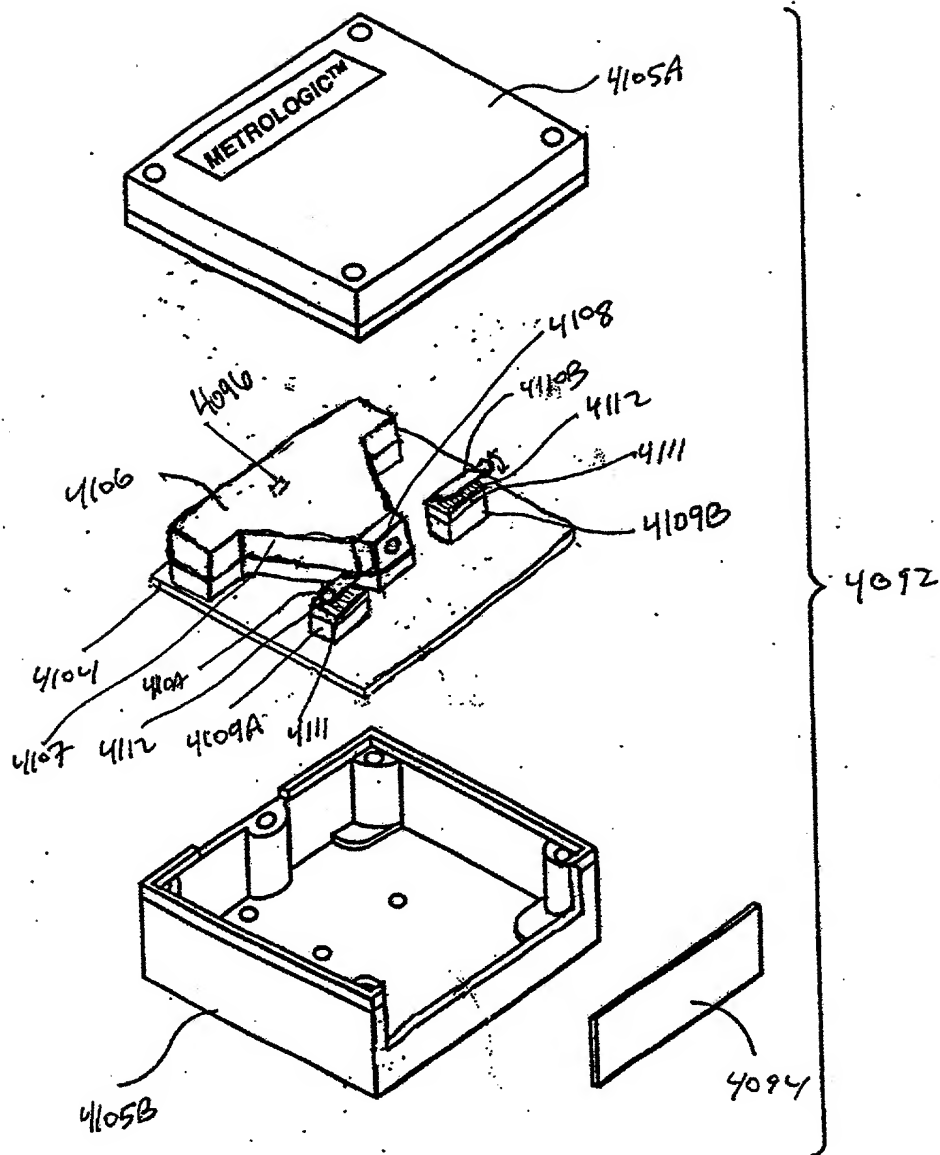


FIG. 55B

Brooks cell  
Fig. 126A-6B

202020 25489001

340/385

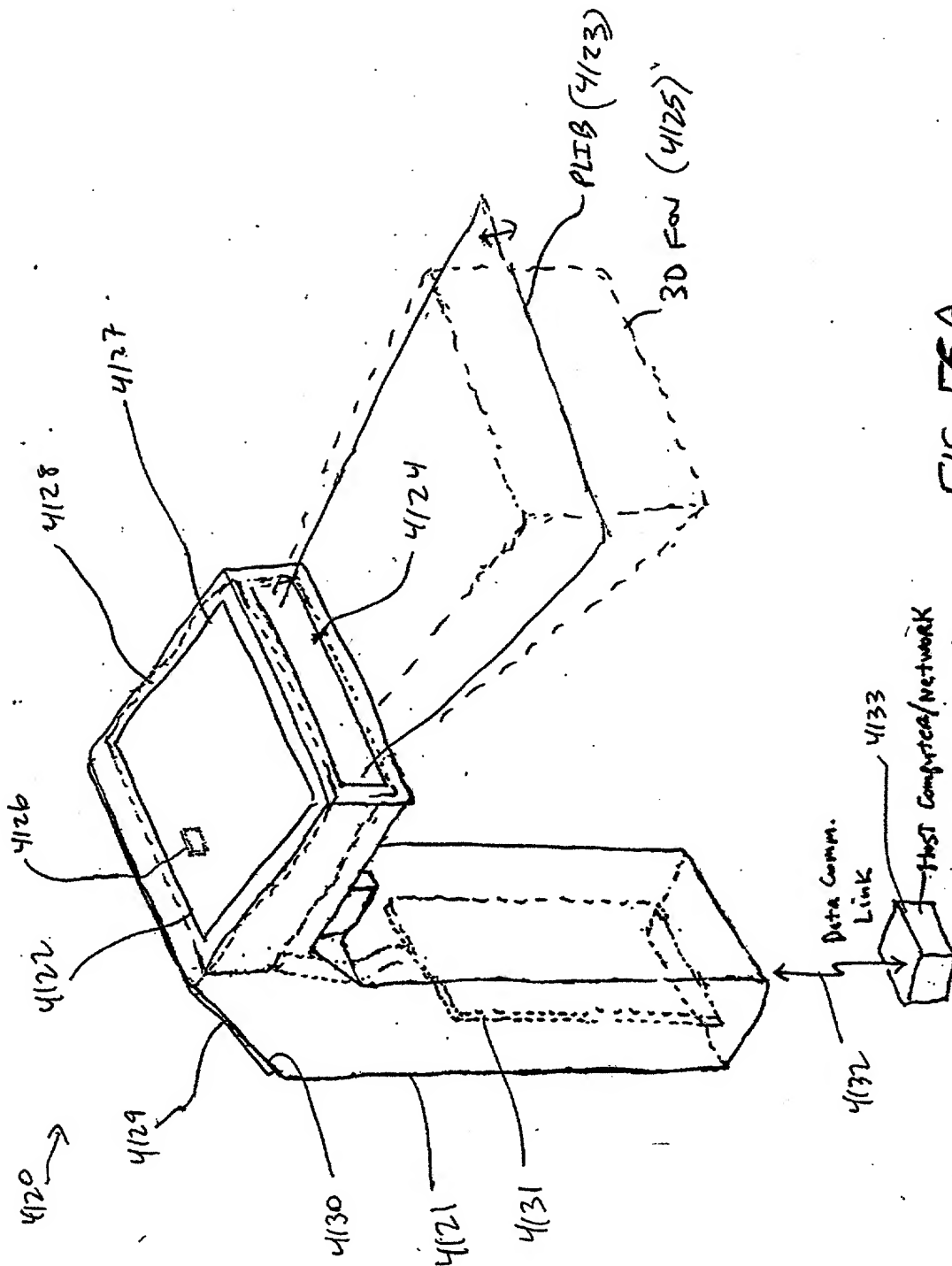


FIG. 56A

10068462.020702

341/385

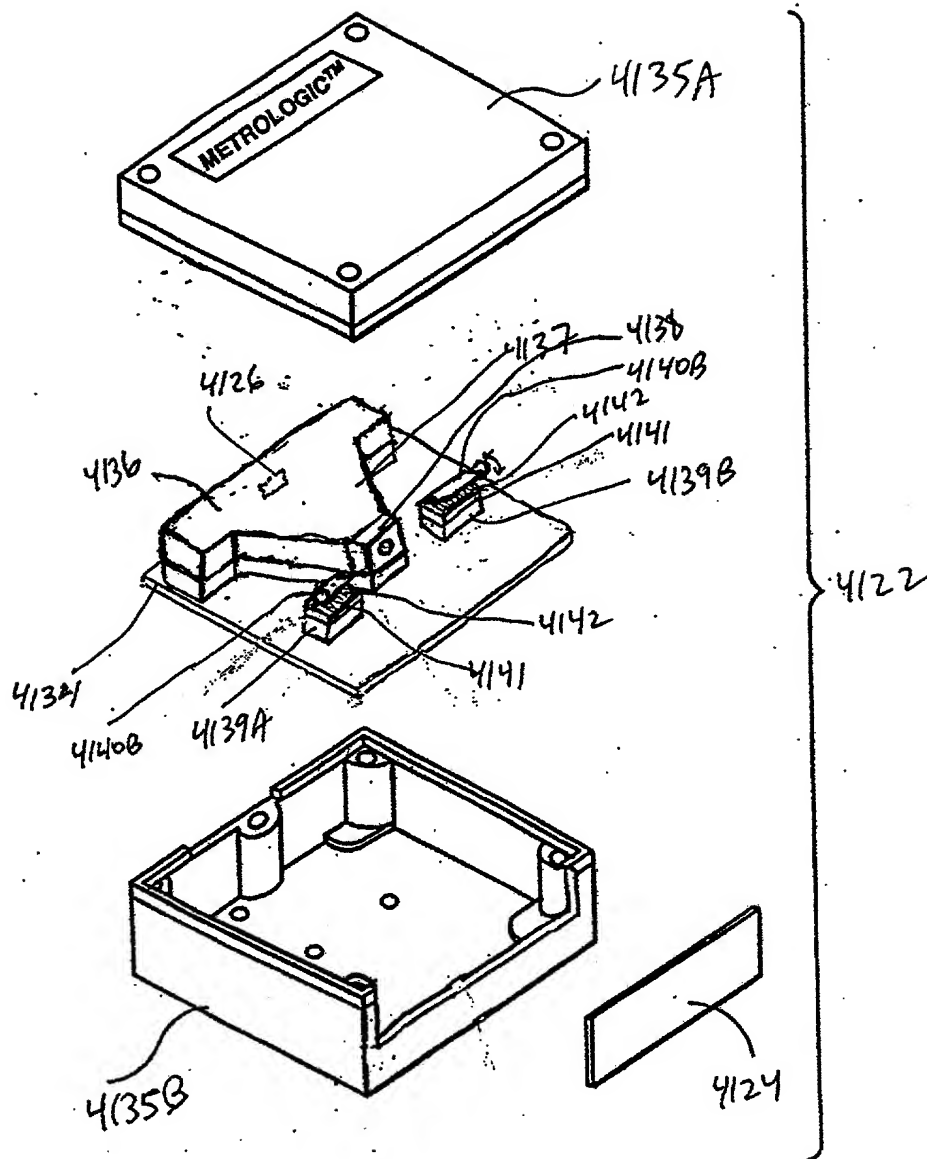


FIG. 56B

DM

Fig. 1F 7A-7C

342/385

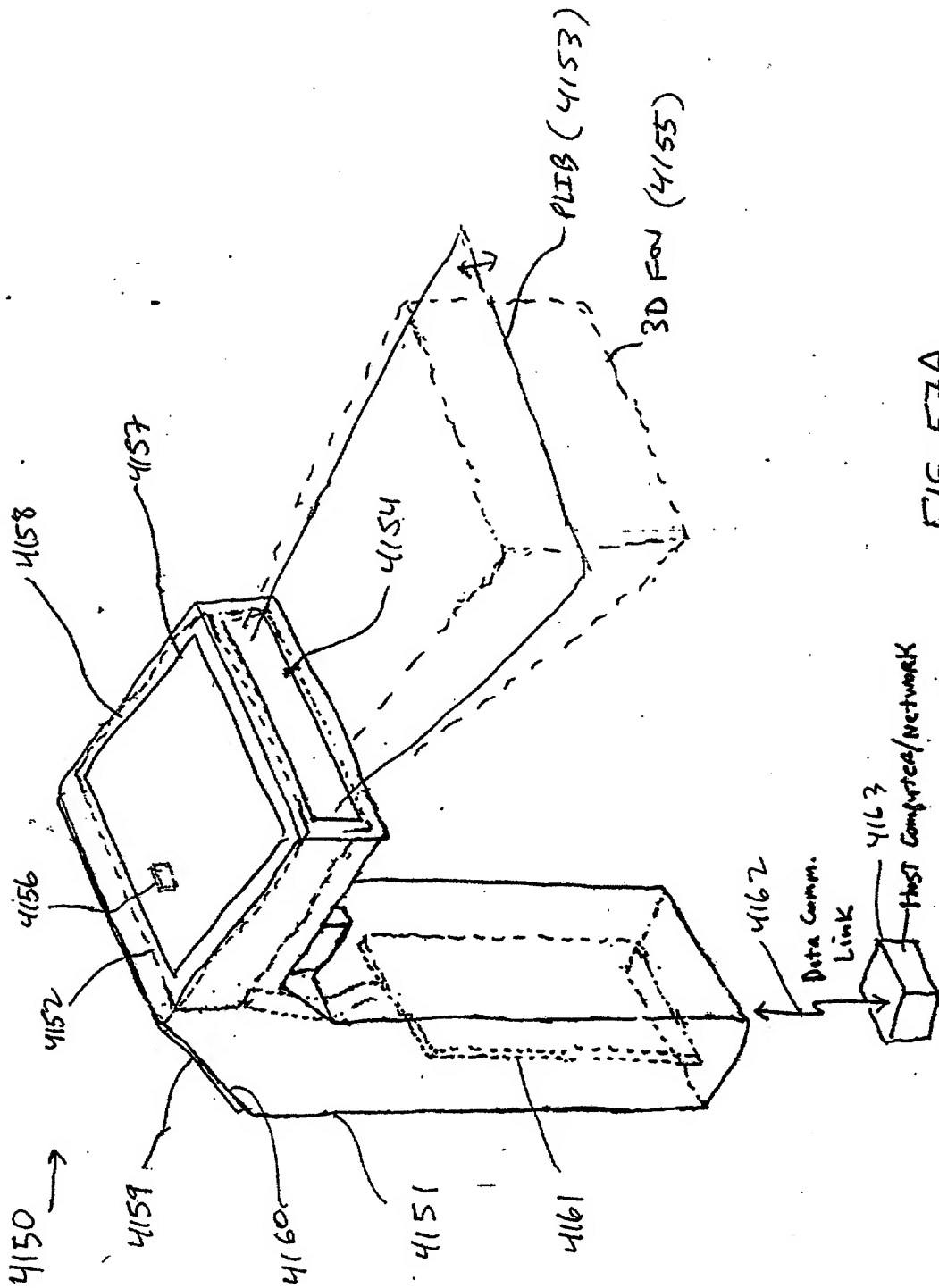


FIG. 57A

10068452.020702

343/385

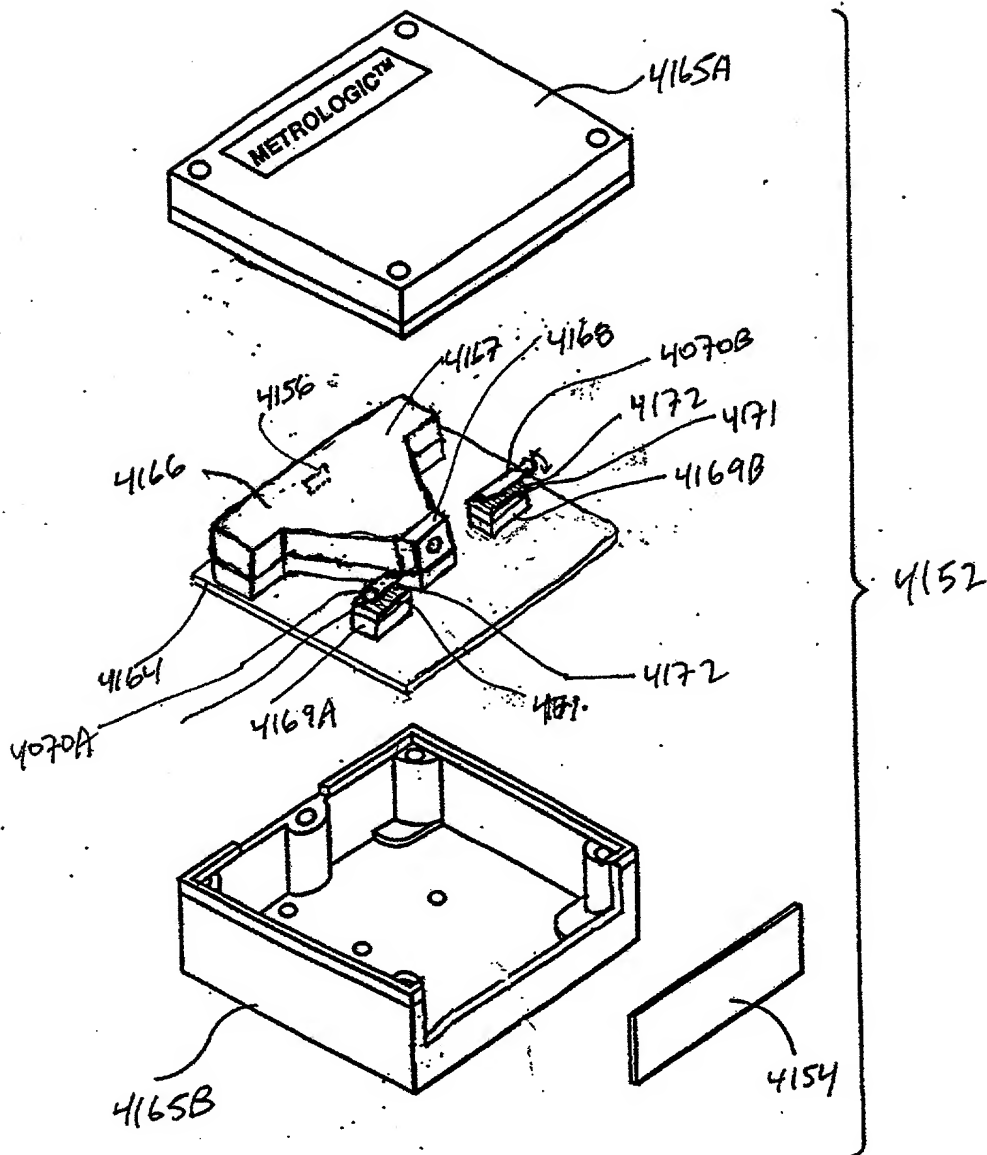
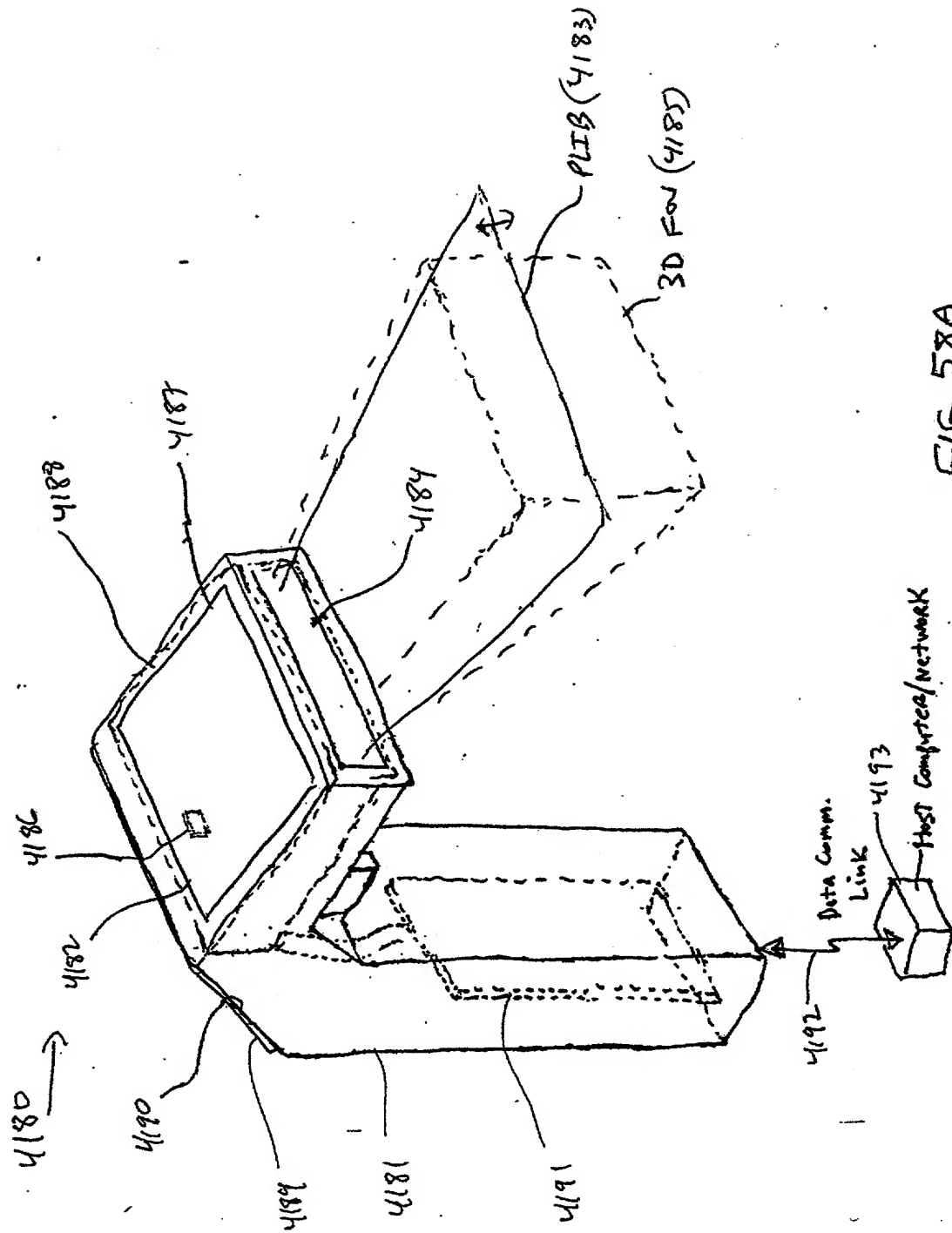


FIG. 57B

Phase only LCR  
pin panel

Figs 178F-86



345/385

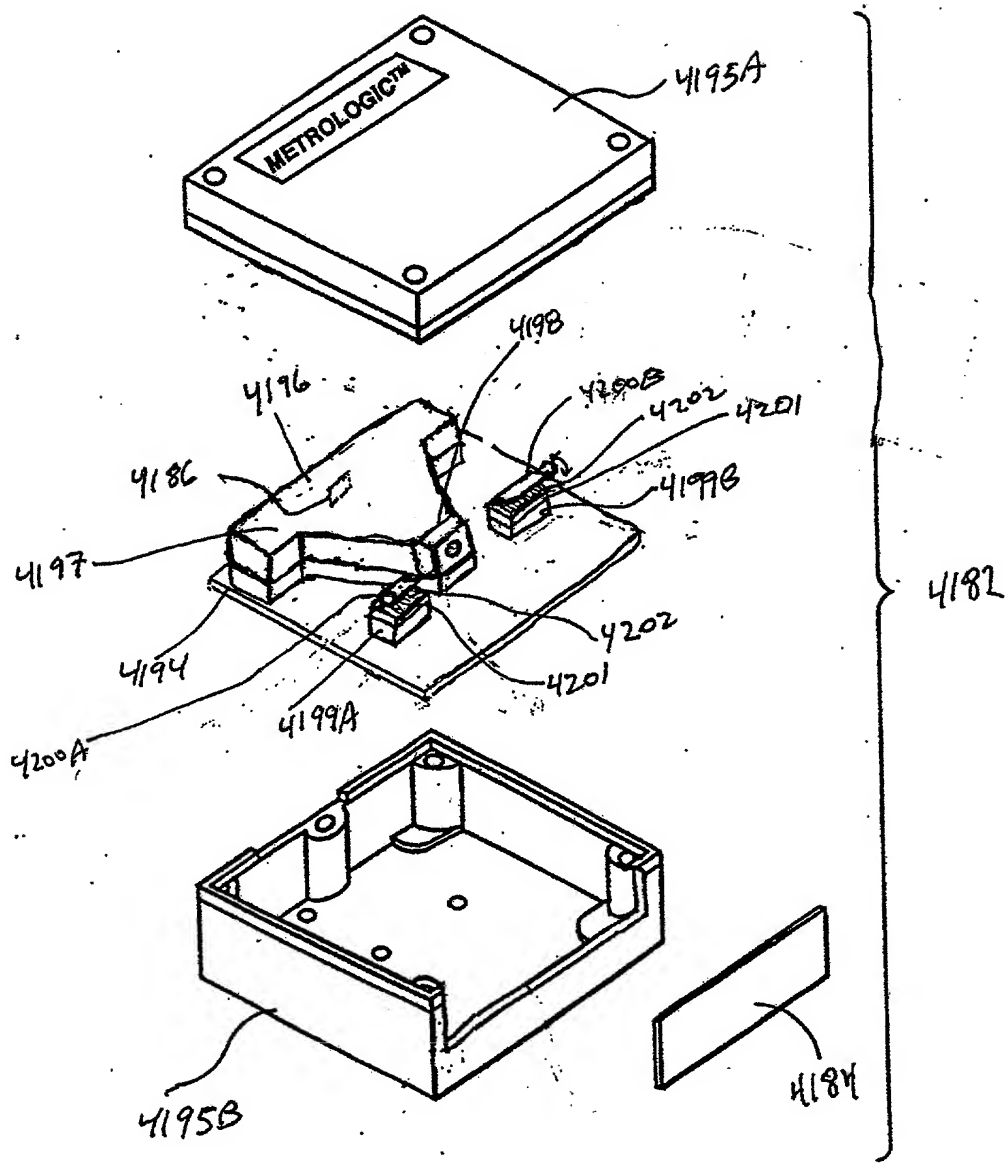


FIG. 58B

HS optical shutter  
Fig. 1F 14A-14B

10068462.000702

346/385

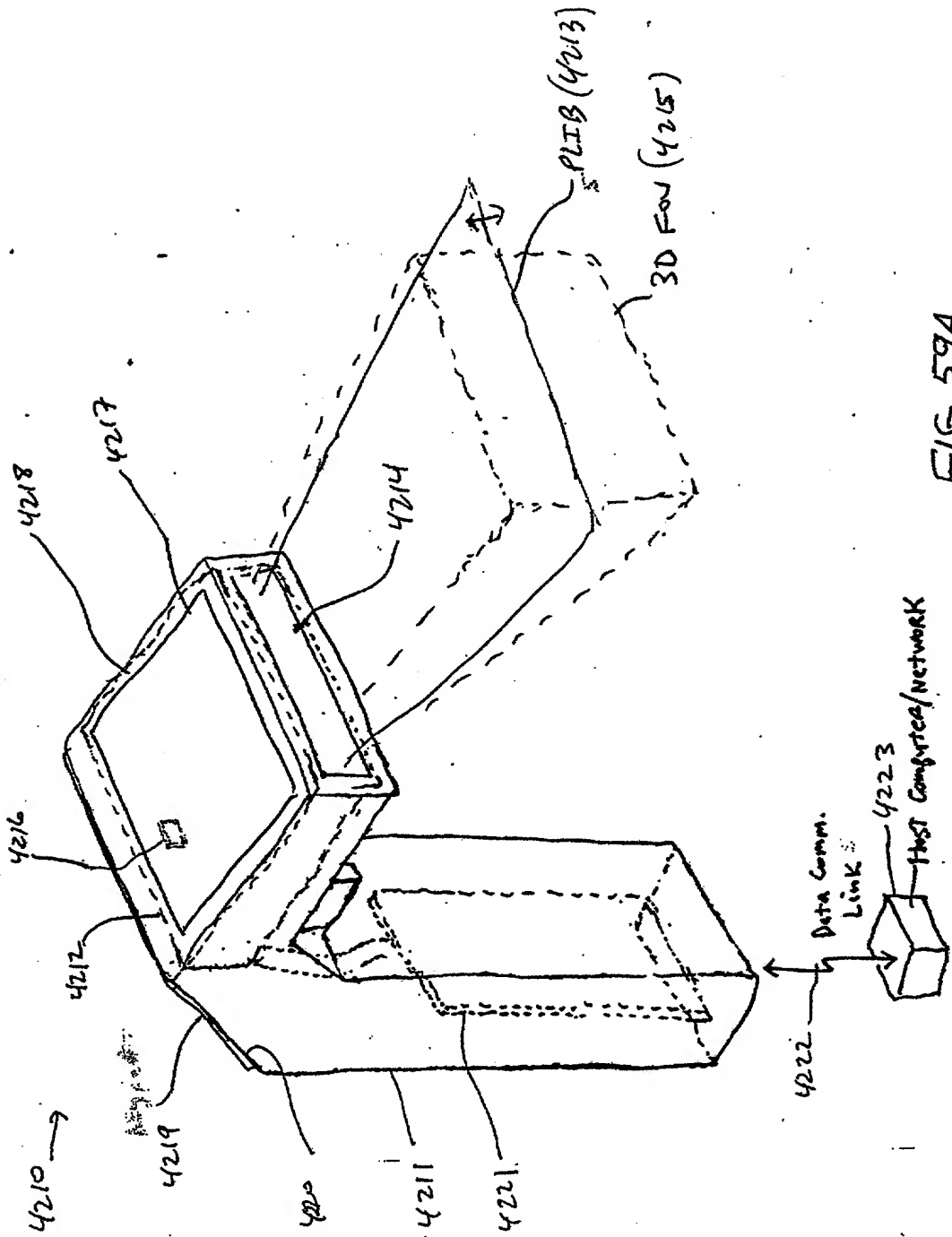


FIG. 59A



202020 294B900T

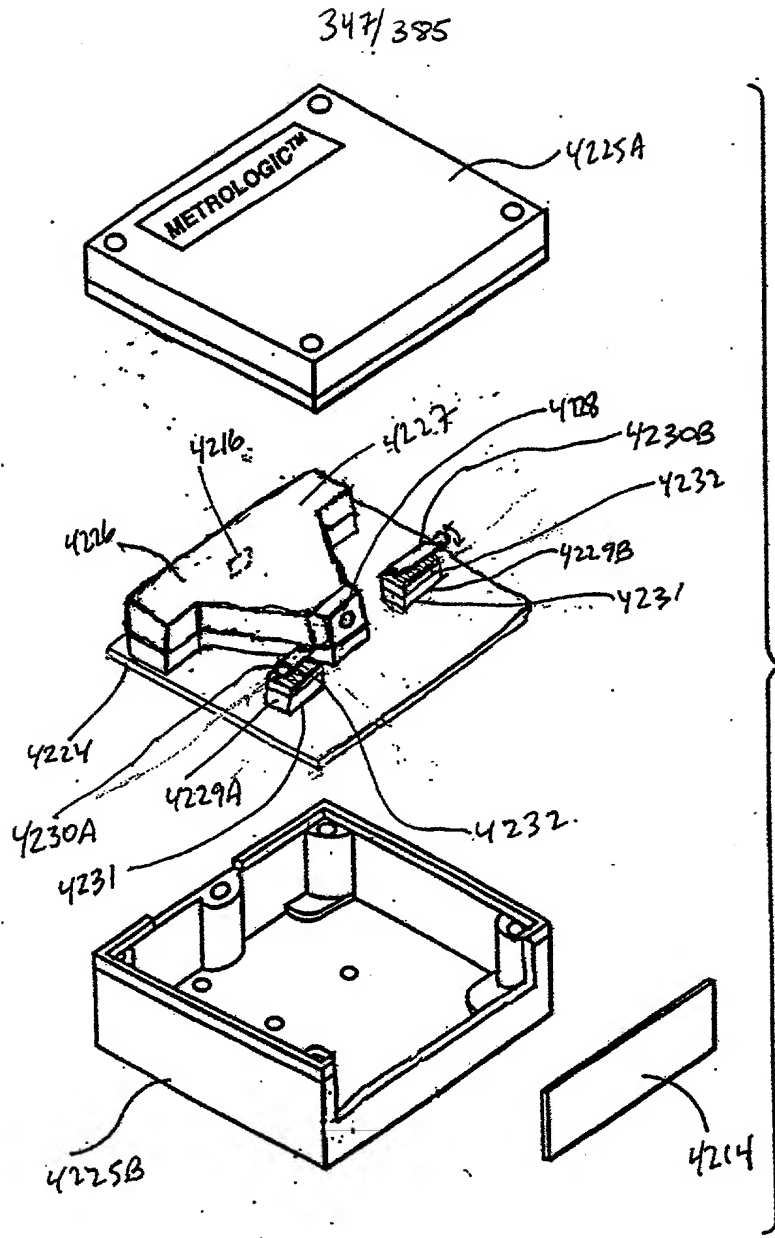


FIG. 59B

MLD  
Fig. 15A-15B

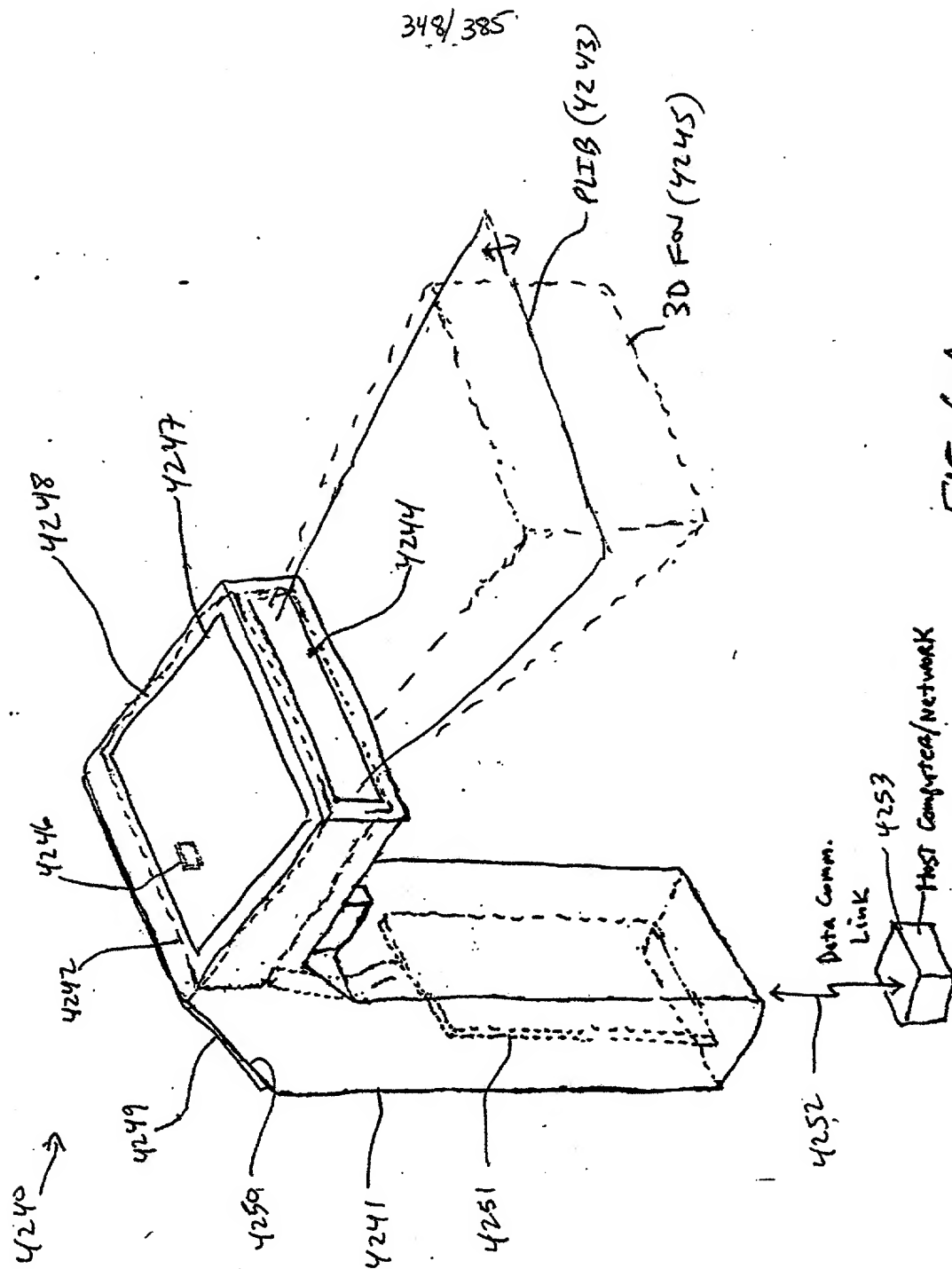


FIG. 60A

349/385

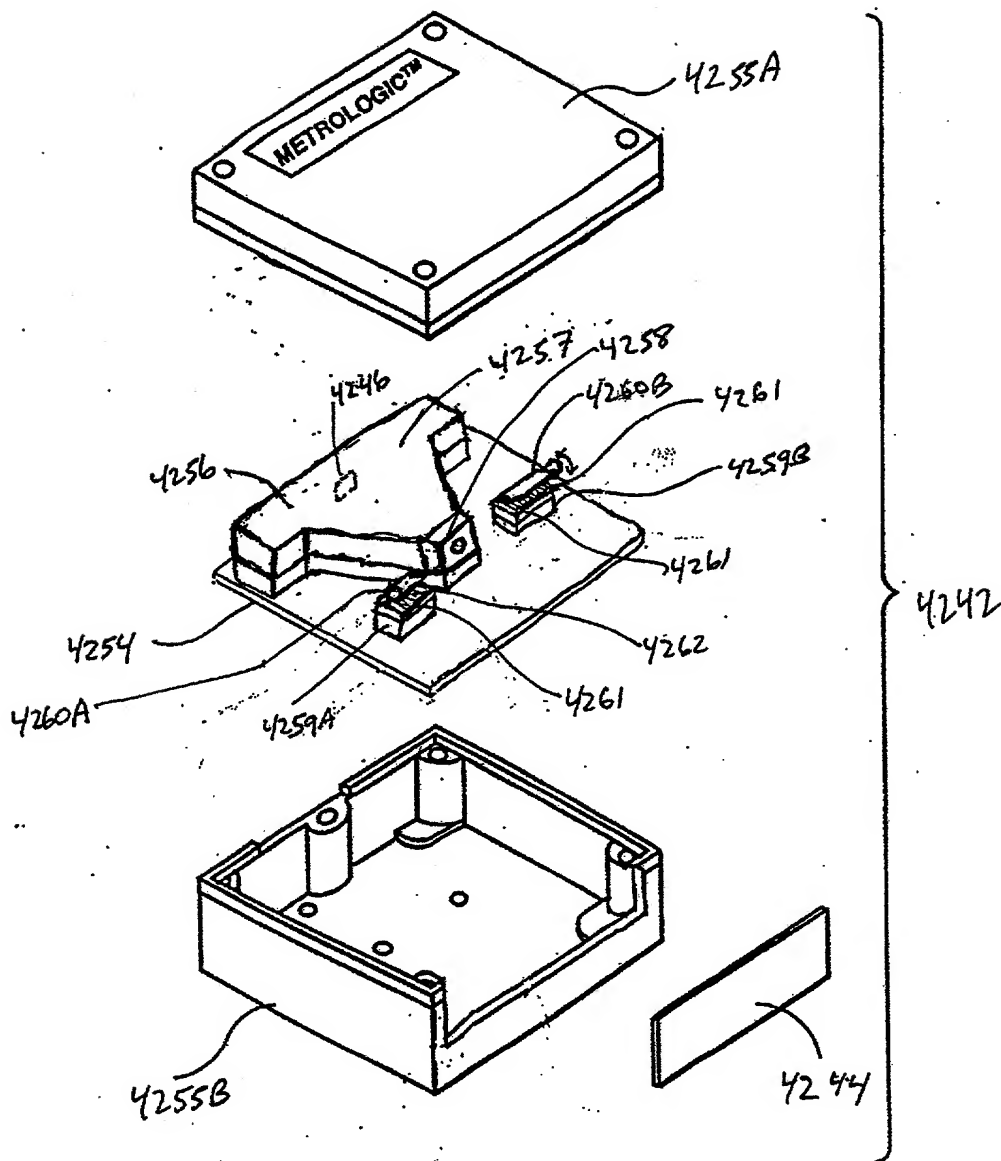
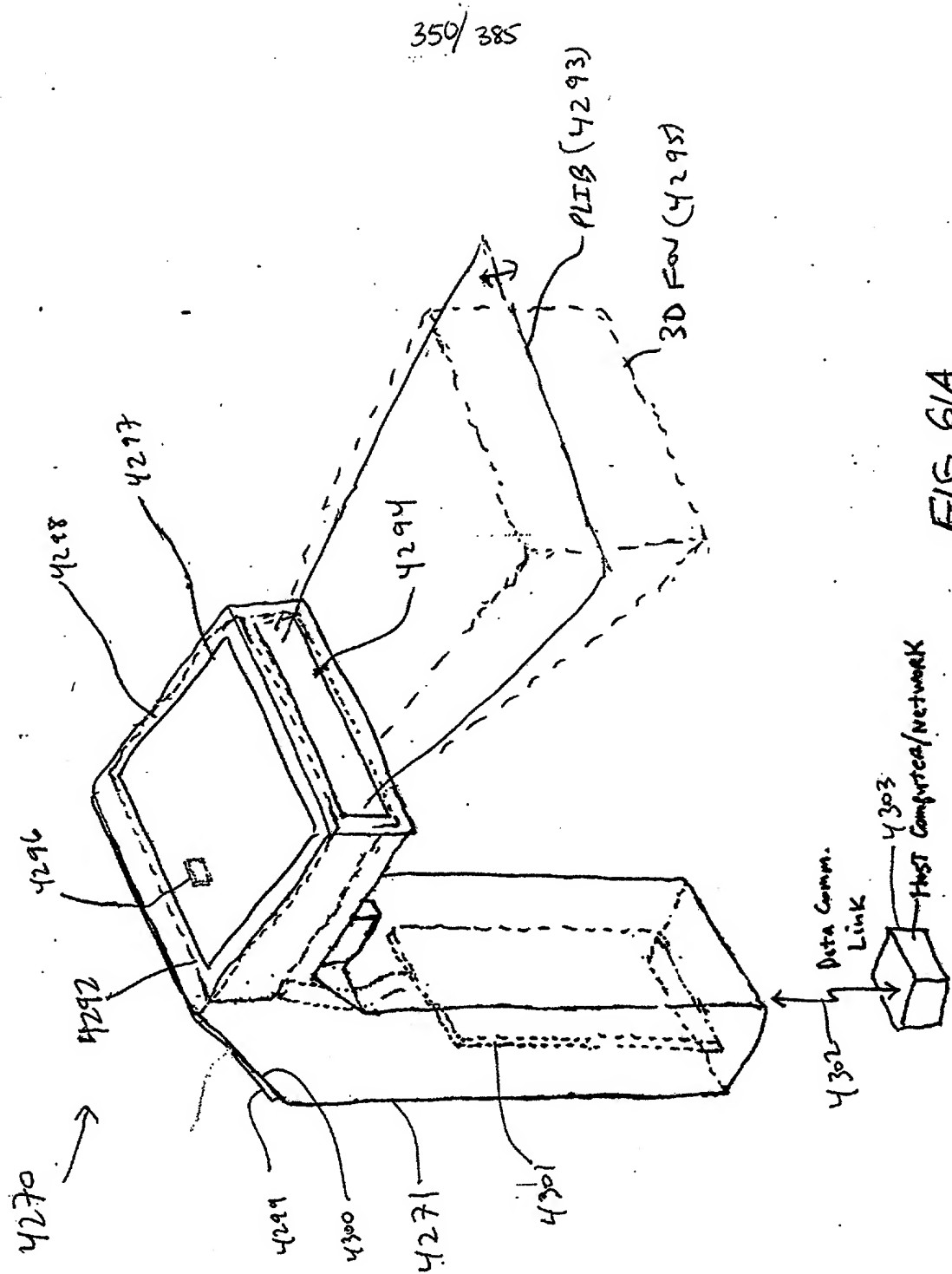


FIG. 60B

Bthalon (Tong. phase mod.)  
Fig. 1 I 17A-17B



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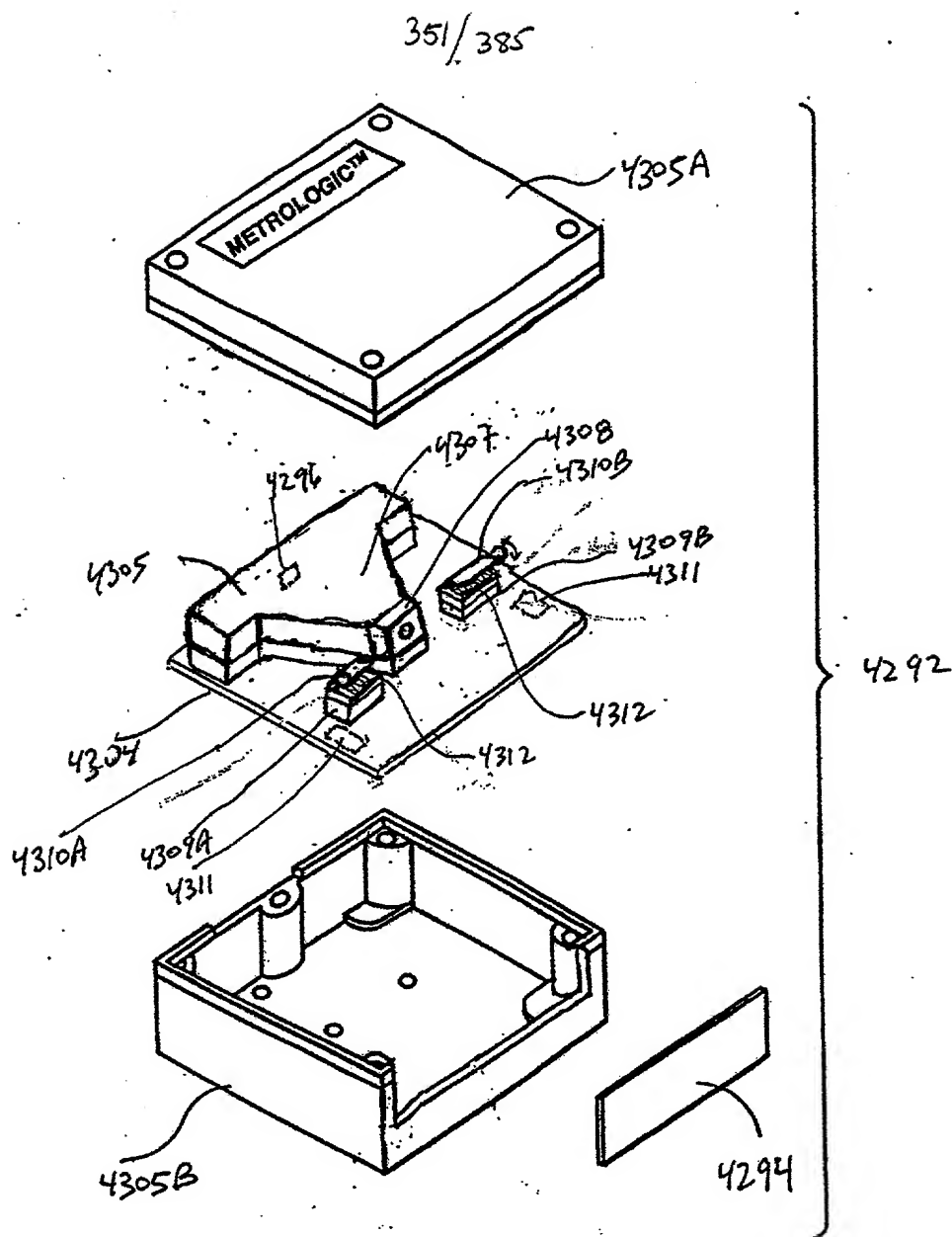


FIG. 61B

Mod. hopping

Fig. 1A-19B

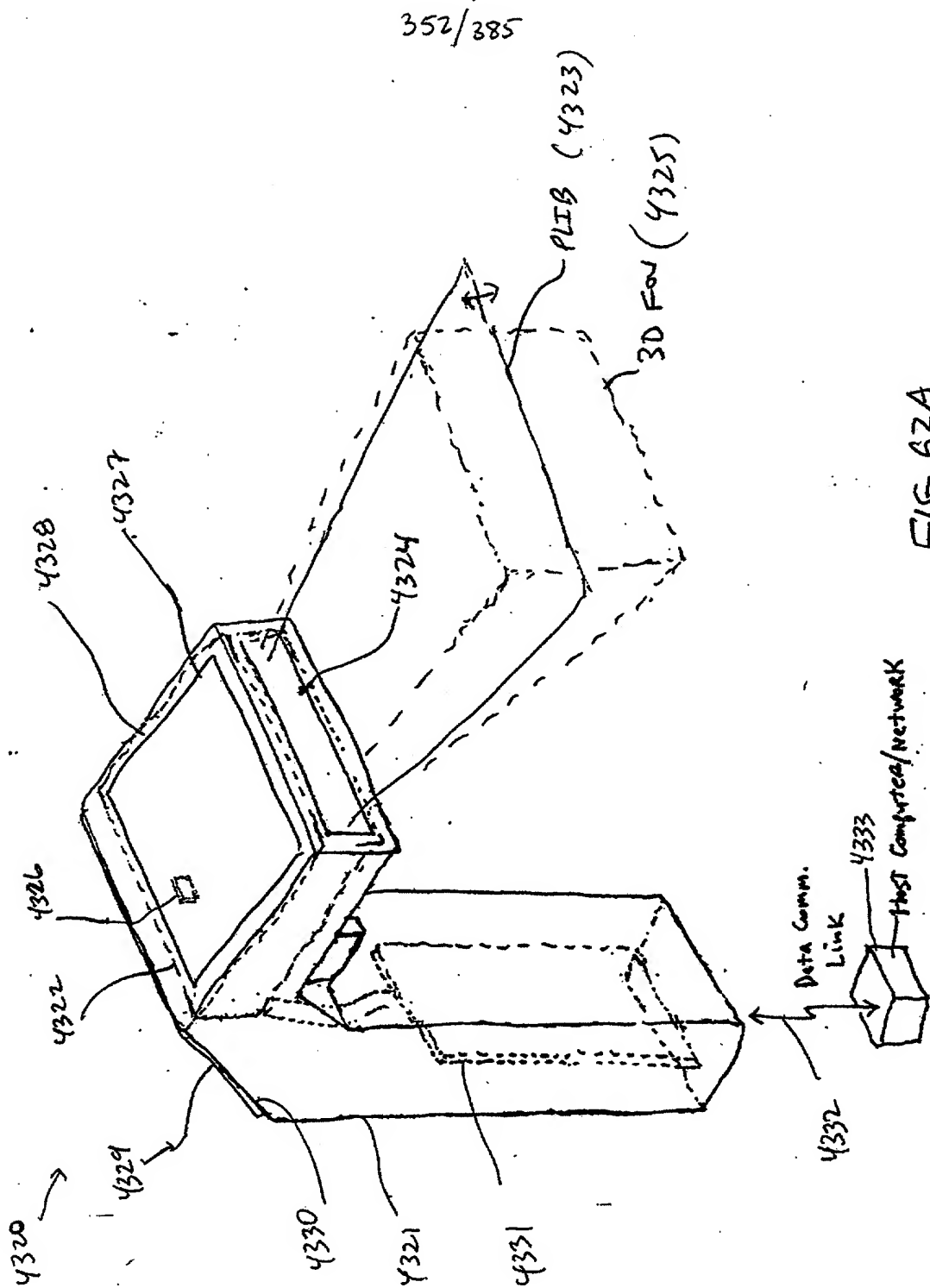


FIG. 62A

20200229489001

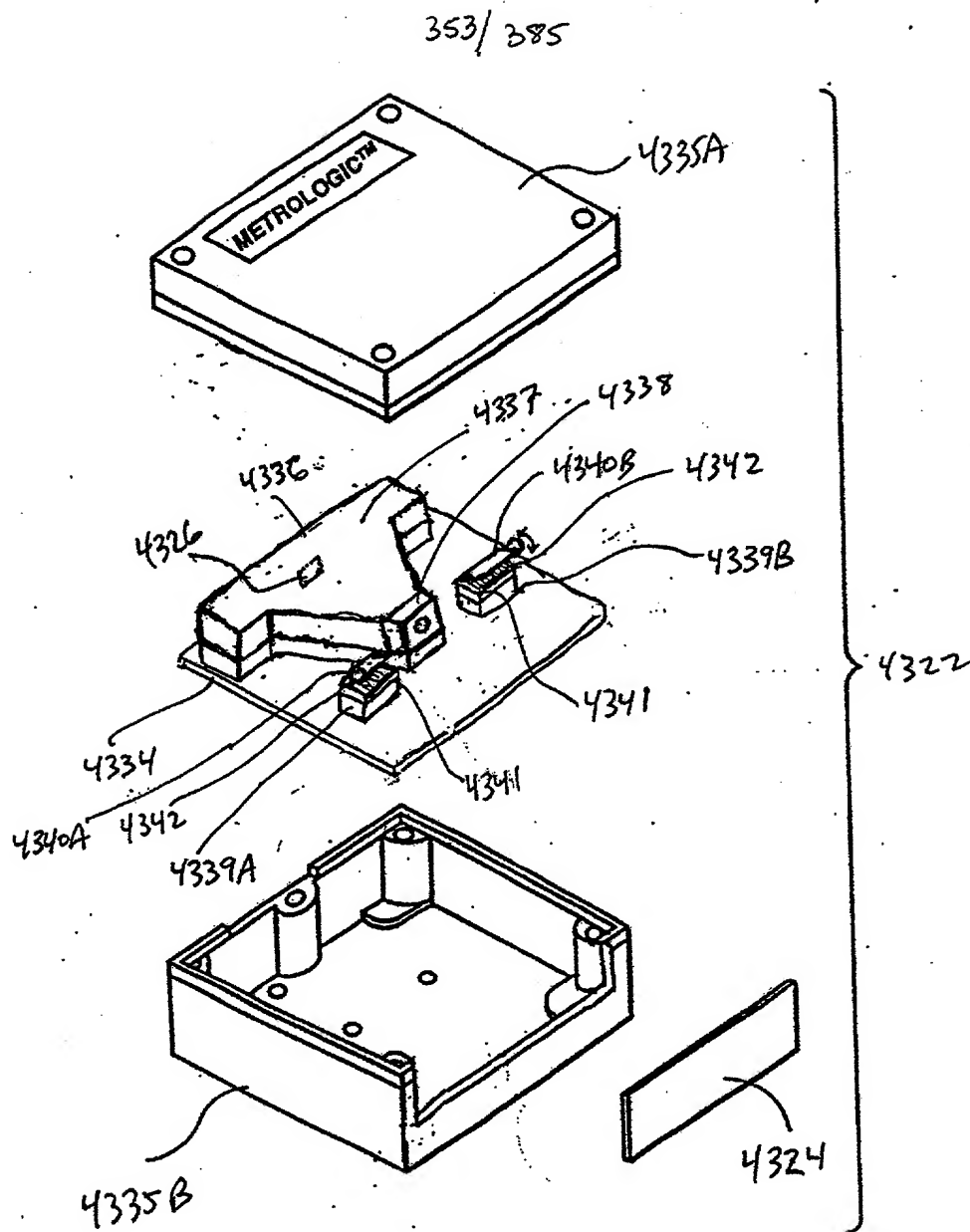


FIG. 62B

measuring  
spot intensity  
mod. panel

Fig. 1F21A-21D





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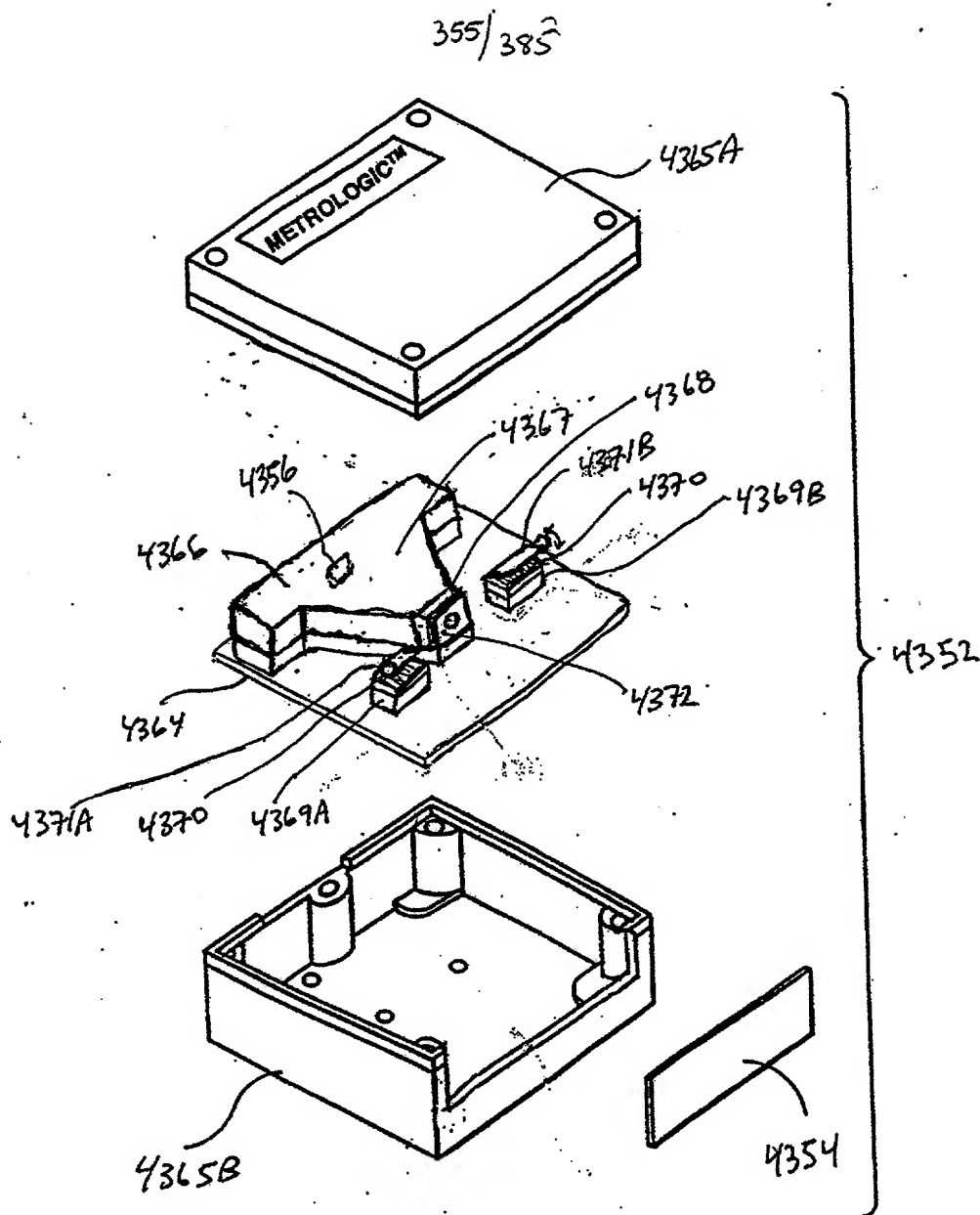


FIG. 63B

Ed. of.  
Mechanical part of the Iris  
Fig. 1<sup>st</sup> 23A - 23B



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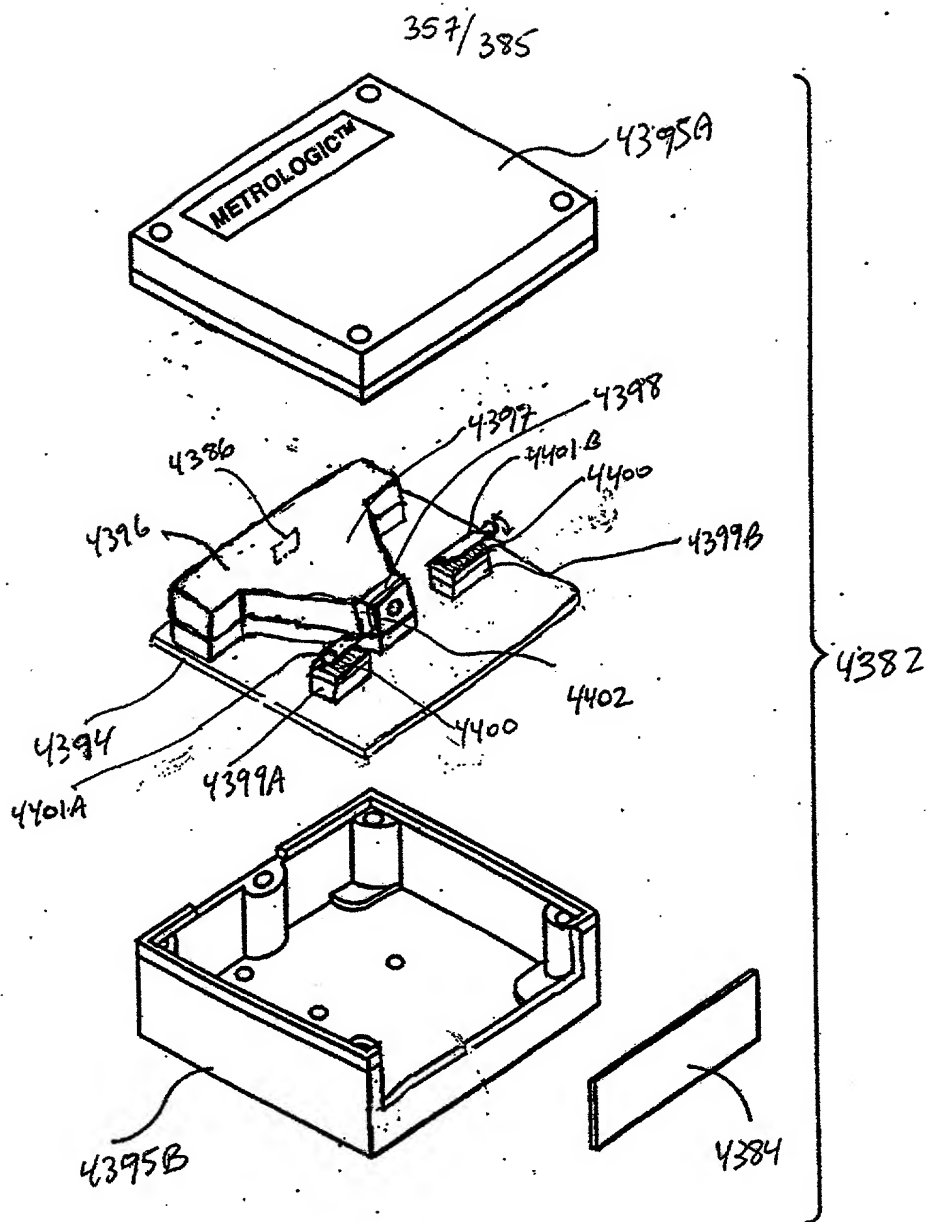


FIG. 64B

\* E-optical  
Shutter Before  
DP Lens  
Fig. 1224A

358/285

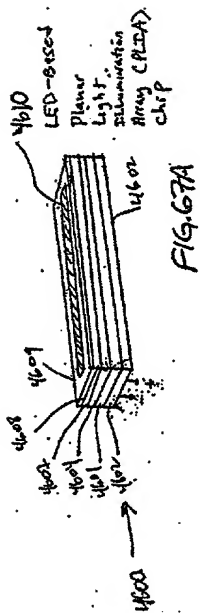


FIG. 67A

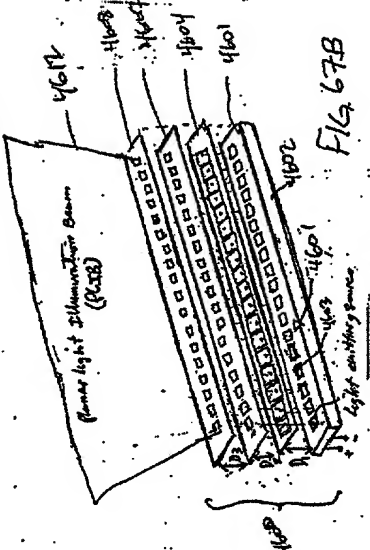


FIG. 67B

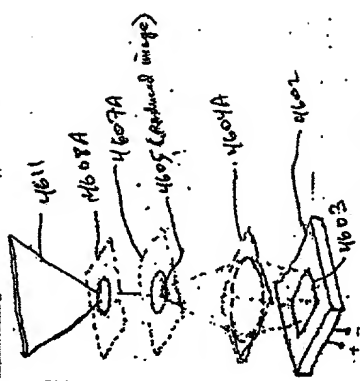


FIG. 67C

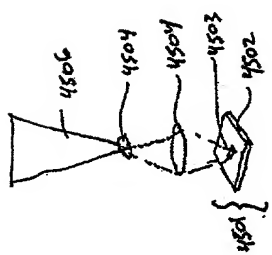
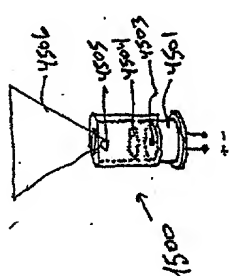
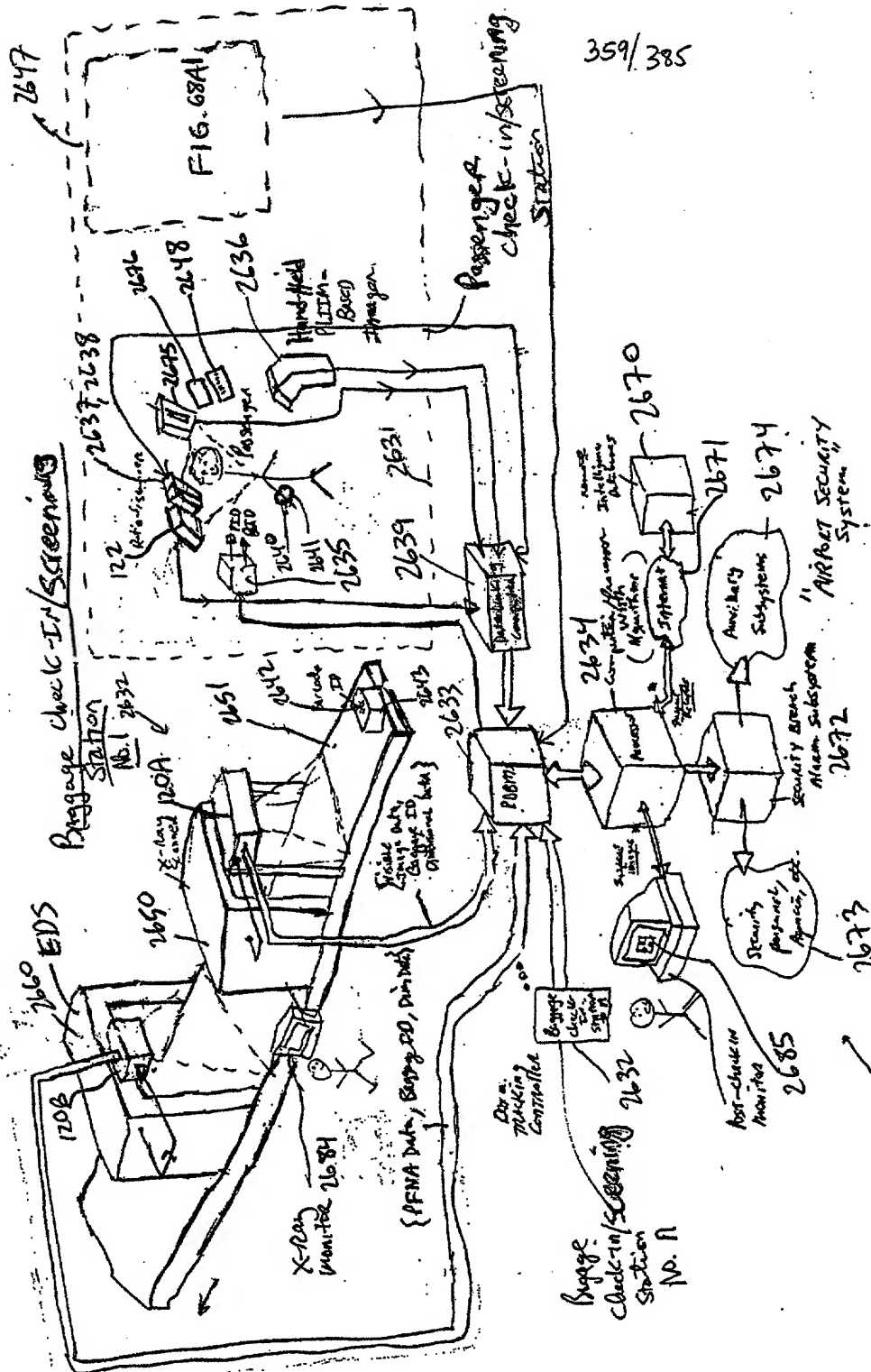


FIG. 65B





359/385

2630

360/385

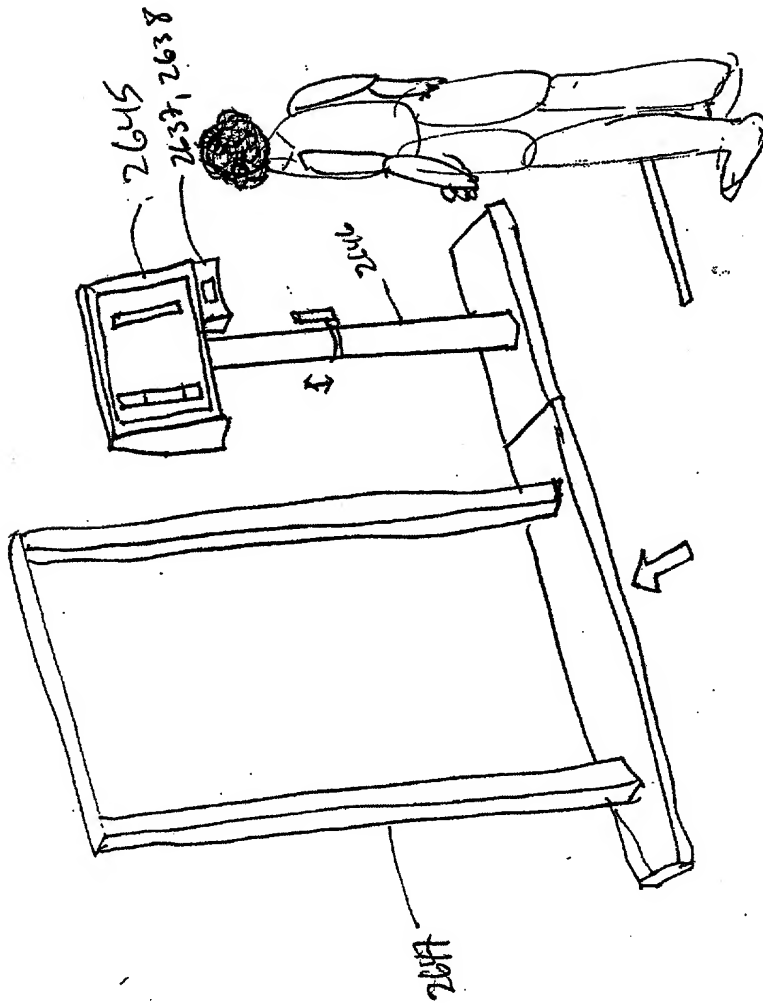


FIG. 68A

361/385

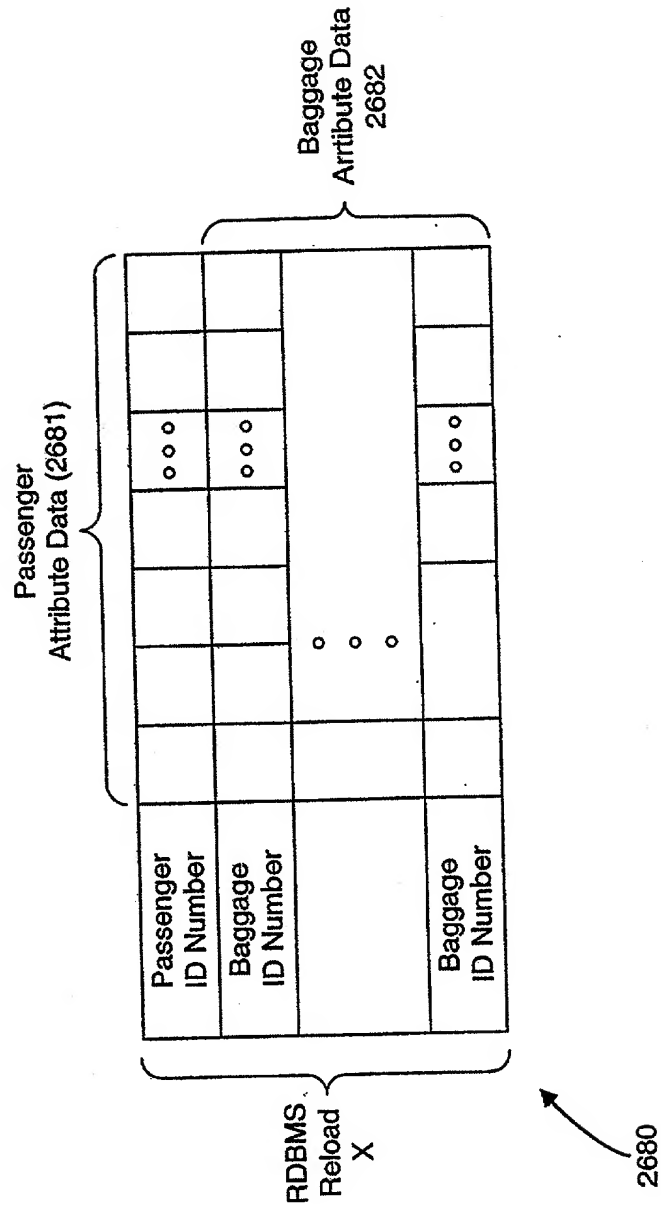


FIG. 68B

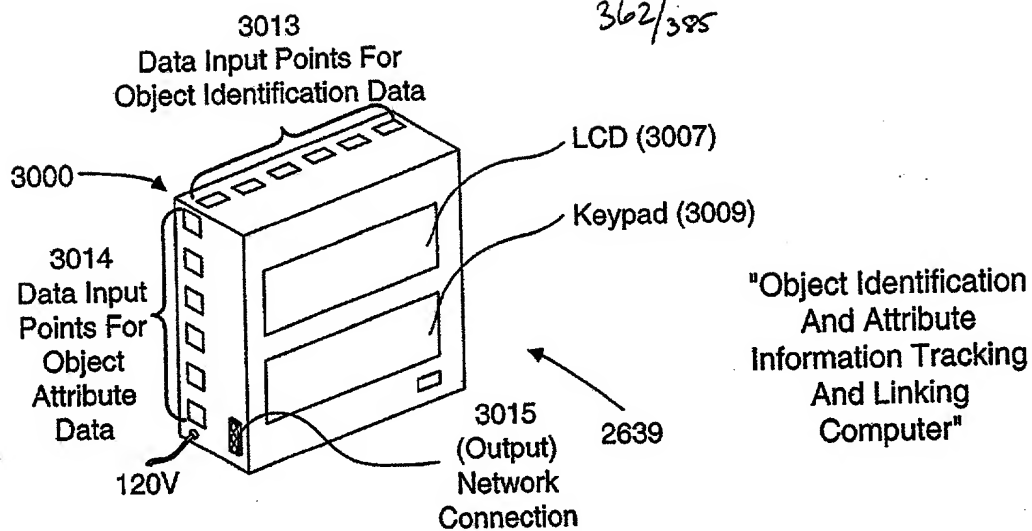


FIG. 68C1

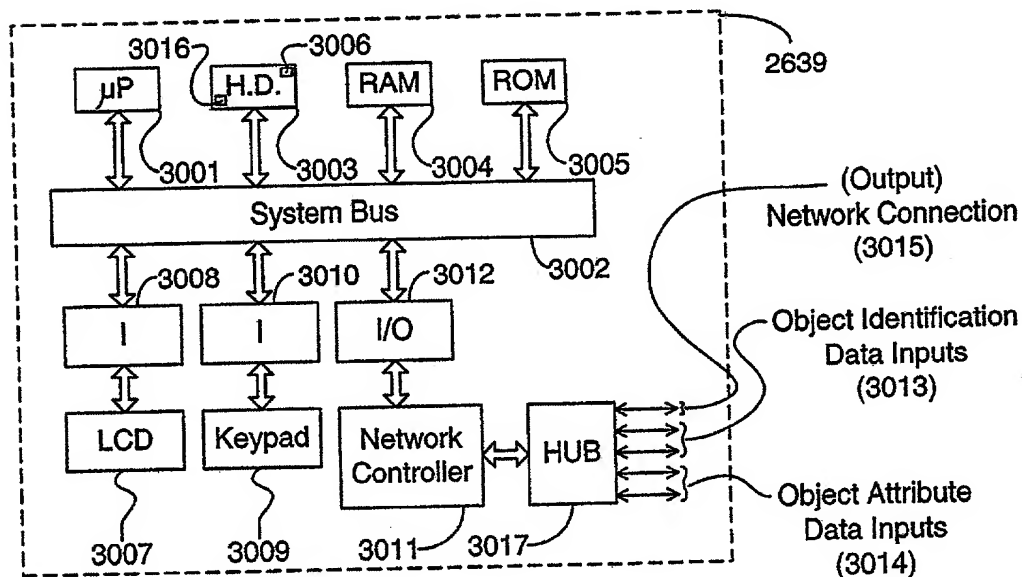


FIG. 68C2



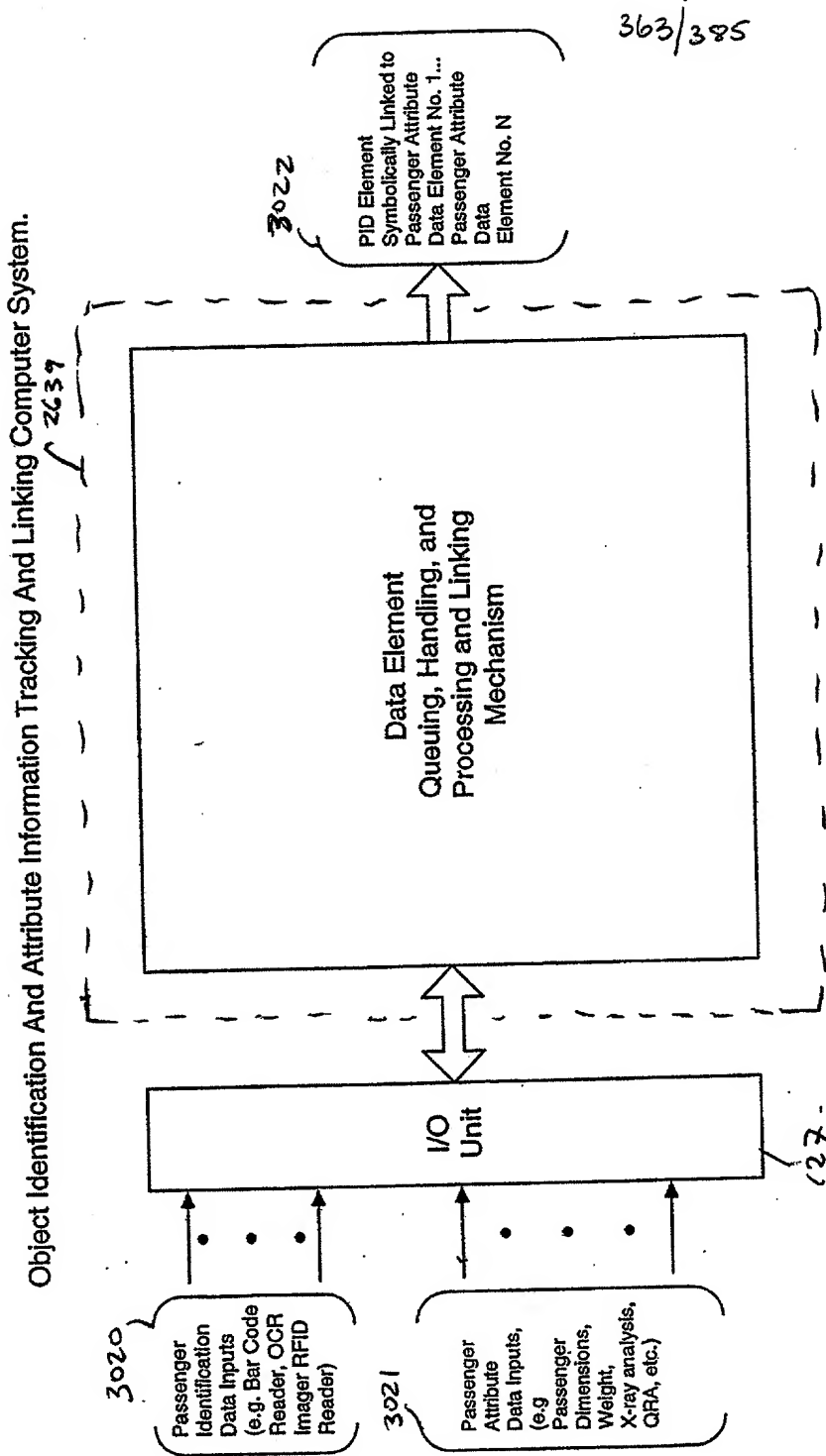


FIG. 68C3

Data Element Queuing, Handling, and Processing Subsystem Employed In The Object Identification  
And Attribute Acquisition System Of The Present Invention. (131)

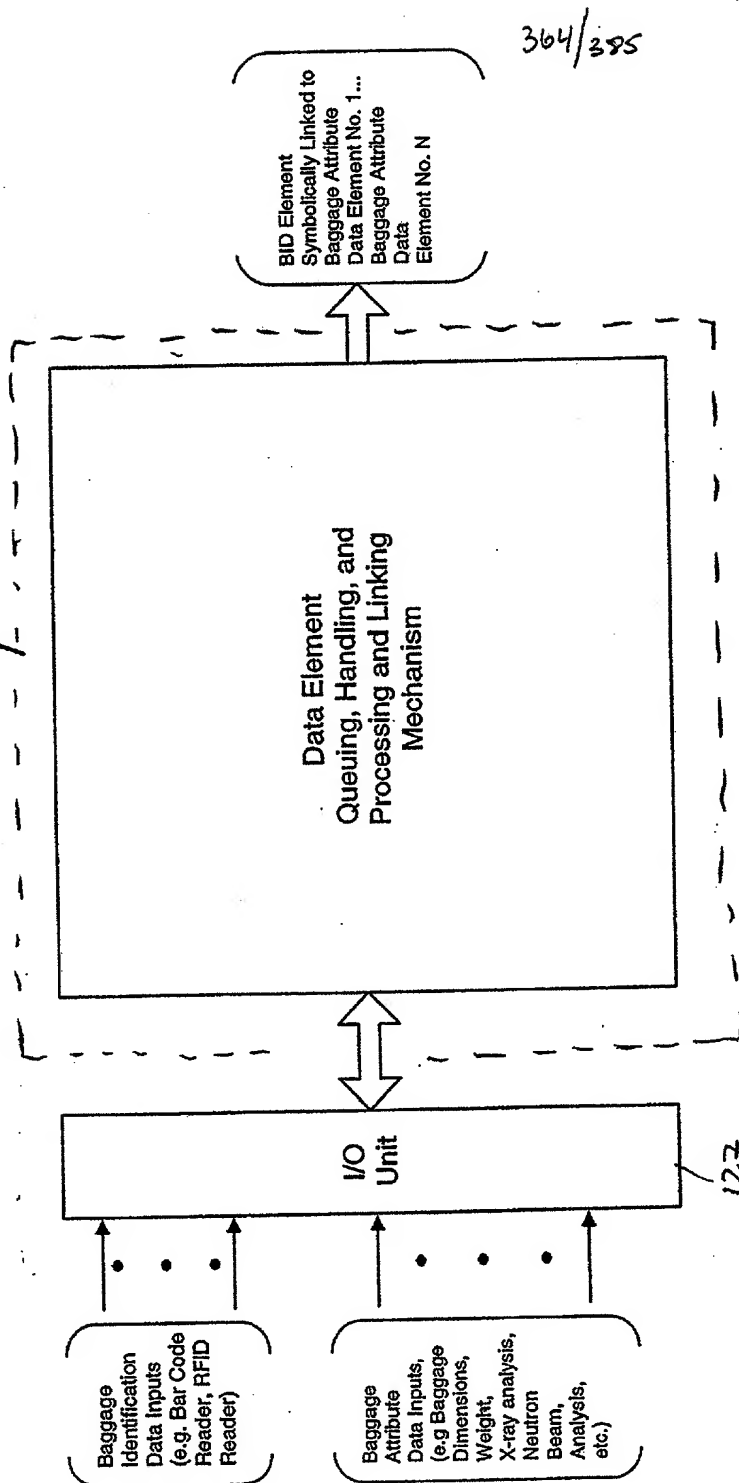


FIG. 68C4

365/385

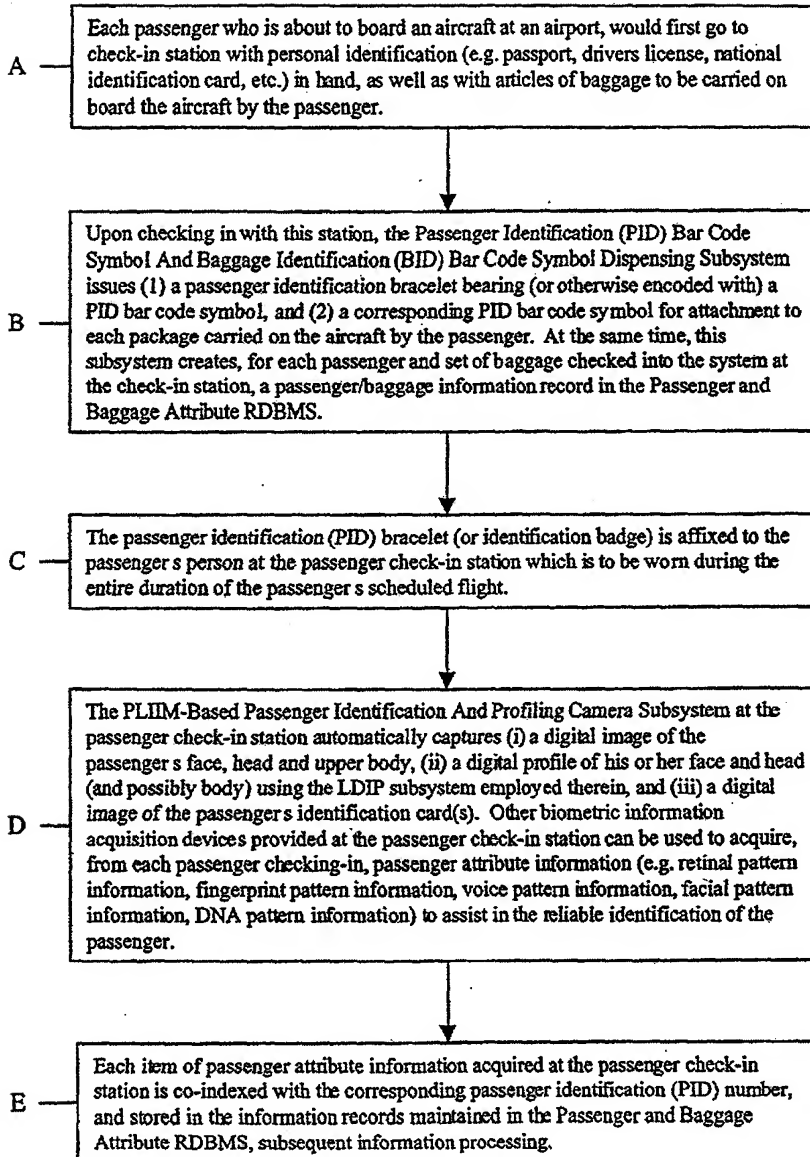


FIG. 68D1

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366/385

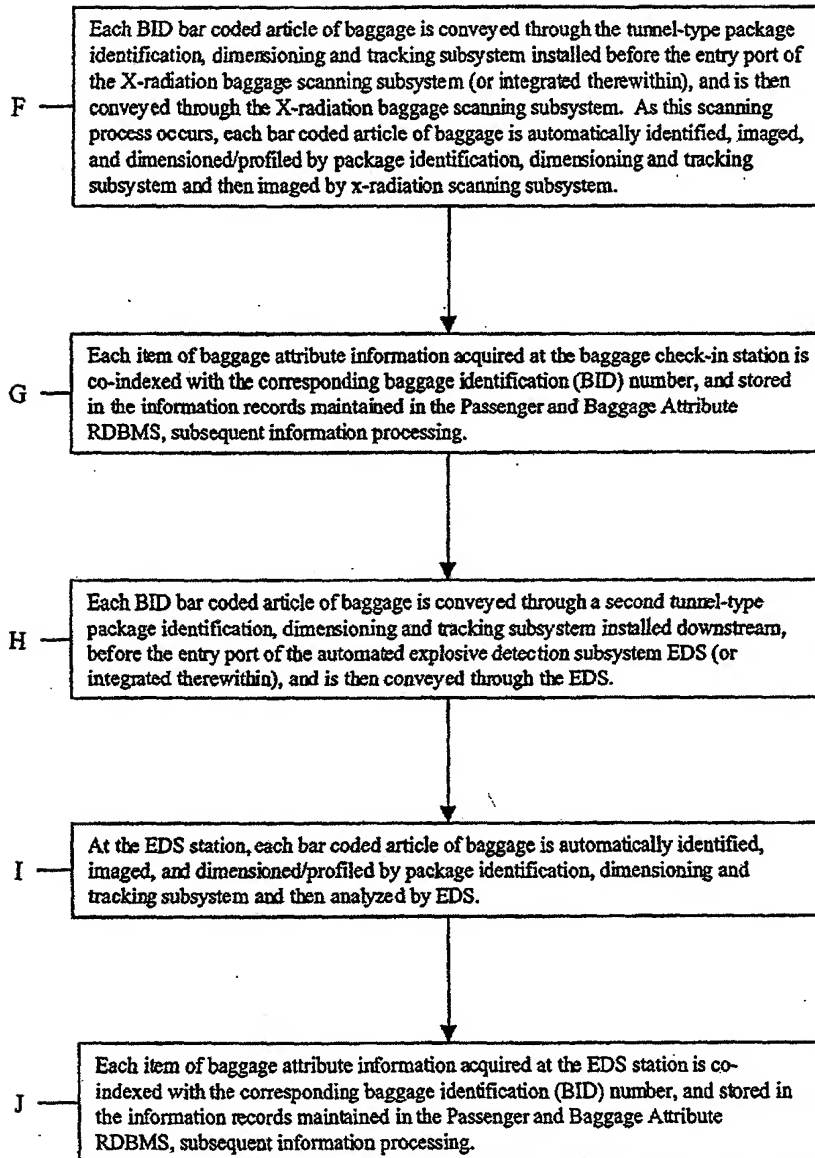


FIG. 68D2

202020-2345001

367/385

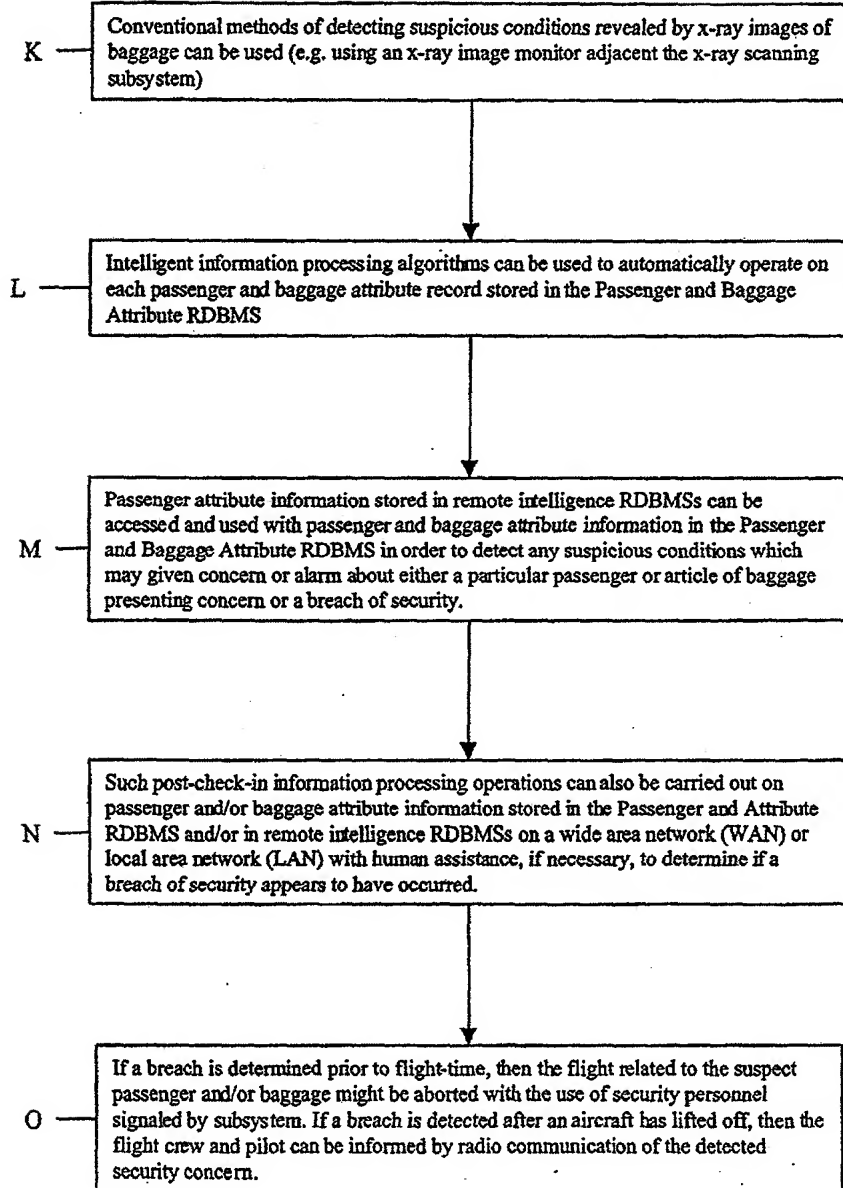


FIG. 68D3

FIG. 69A

369/385

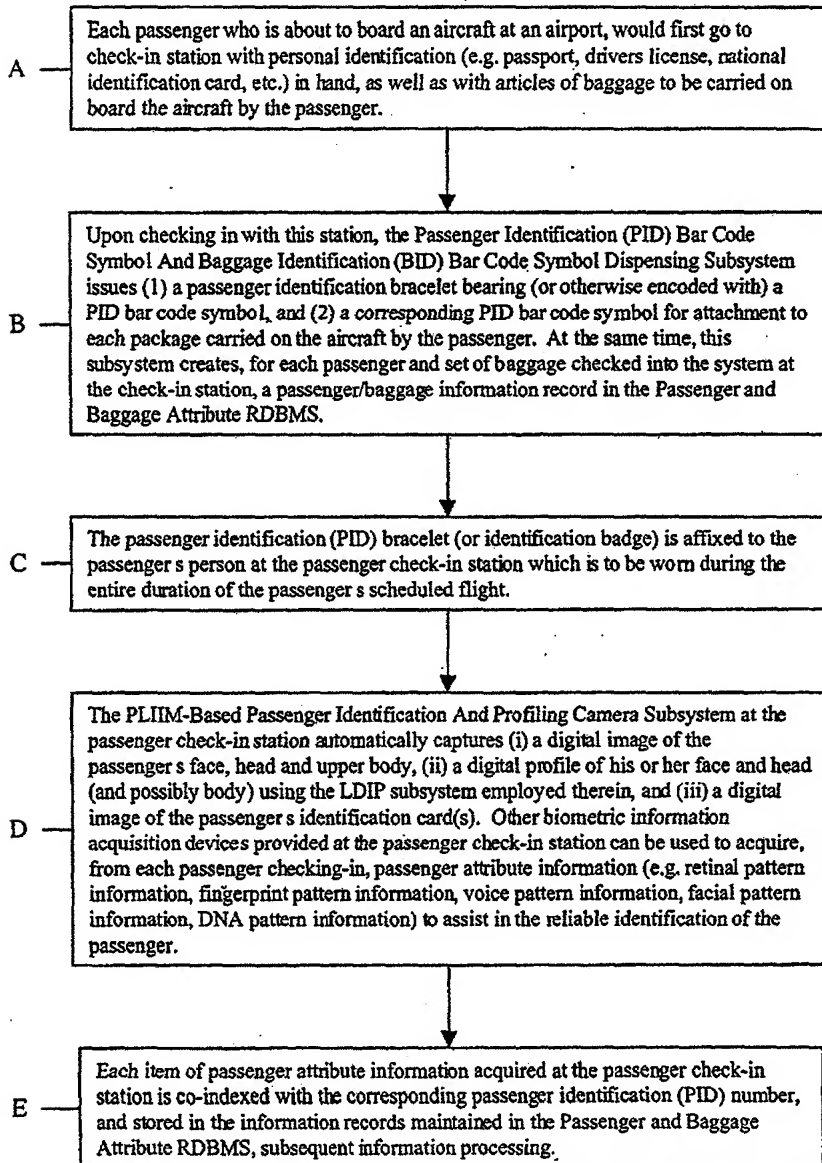


FIG. 69B1

370/395

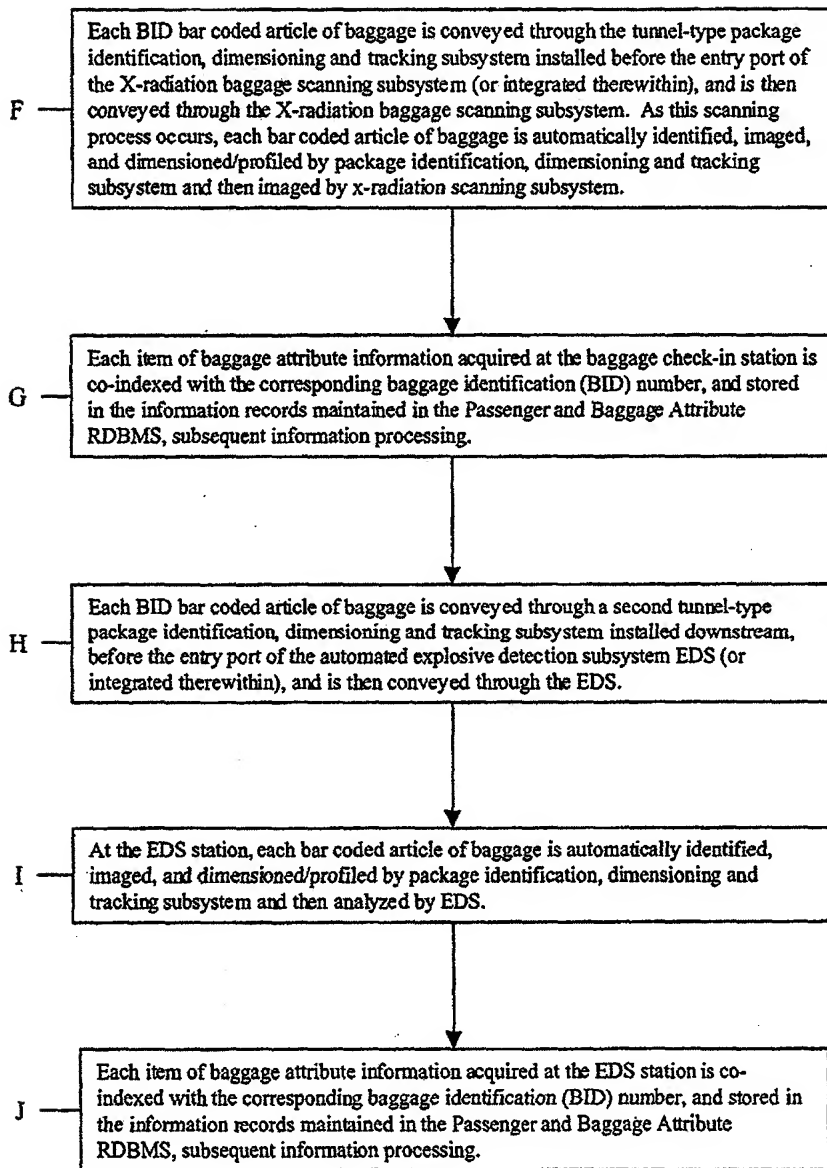


FIG. 69B2



371/385

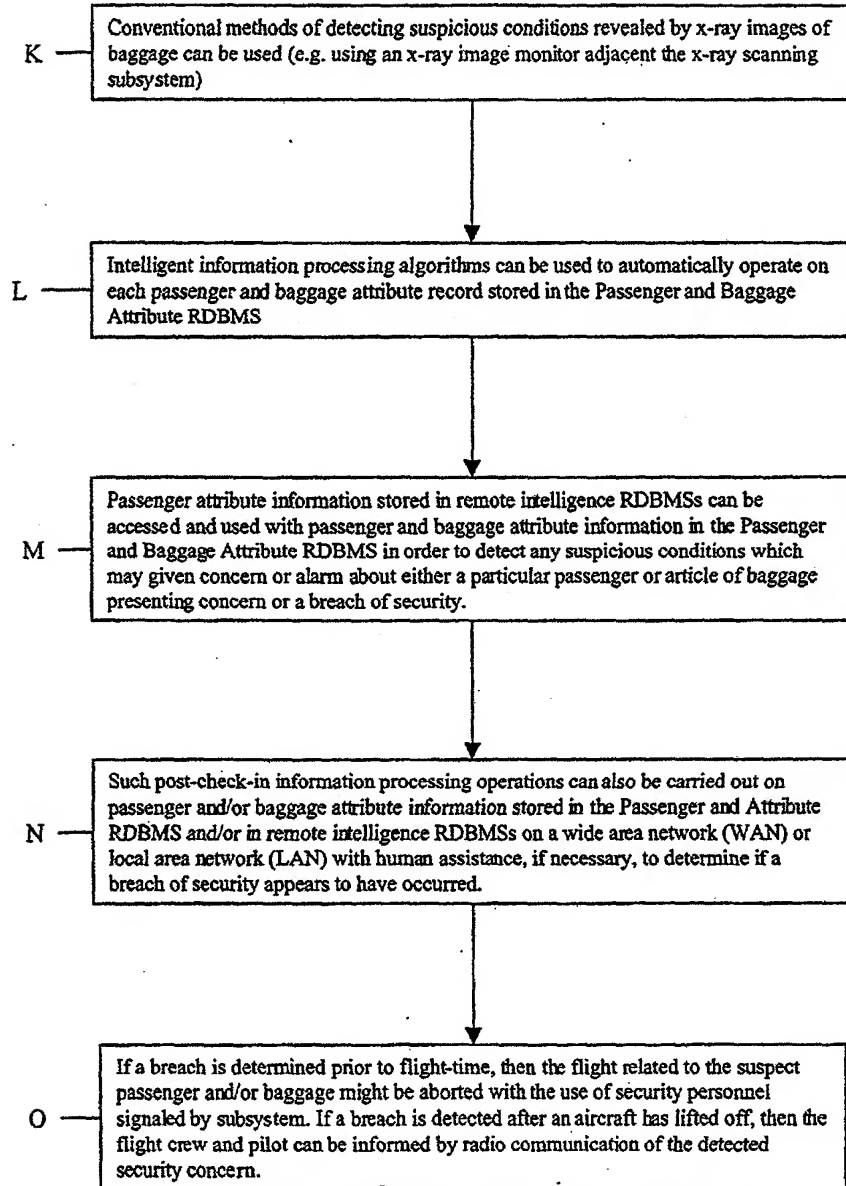
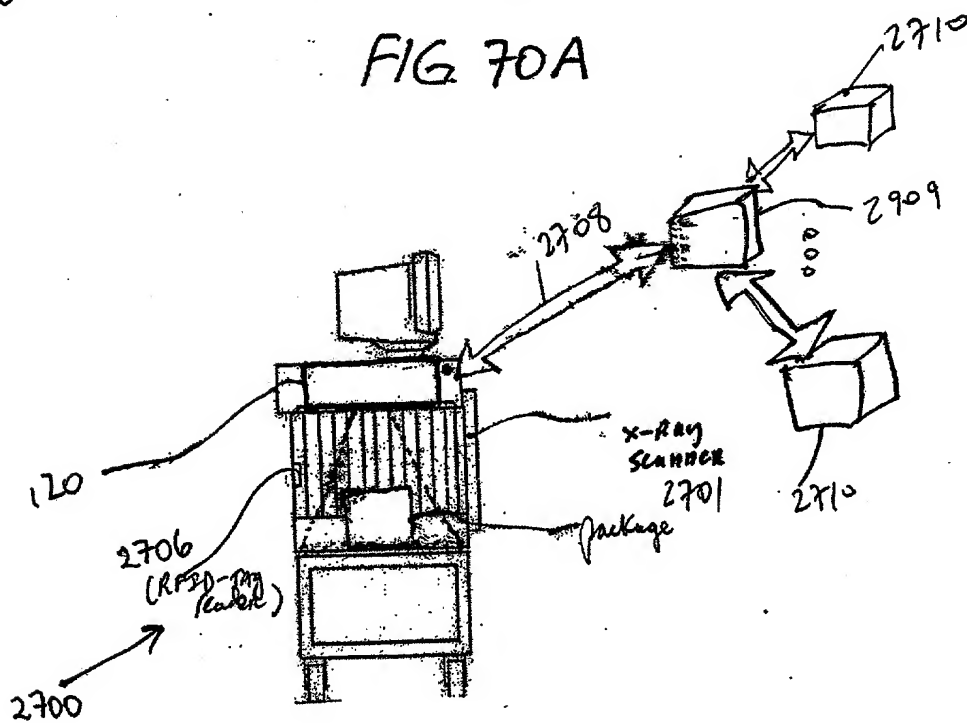
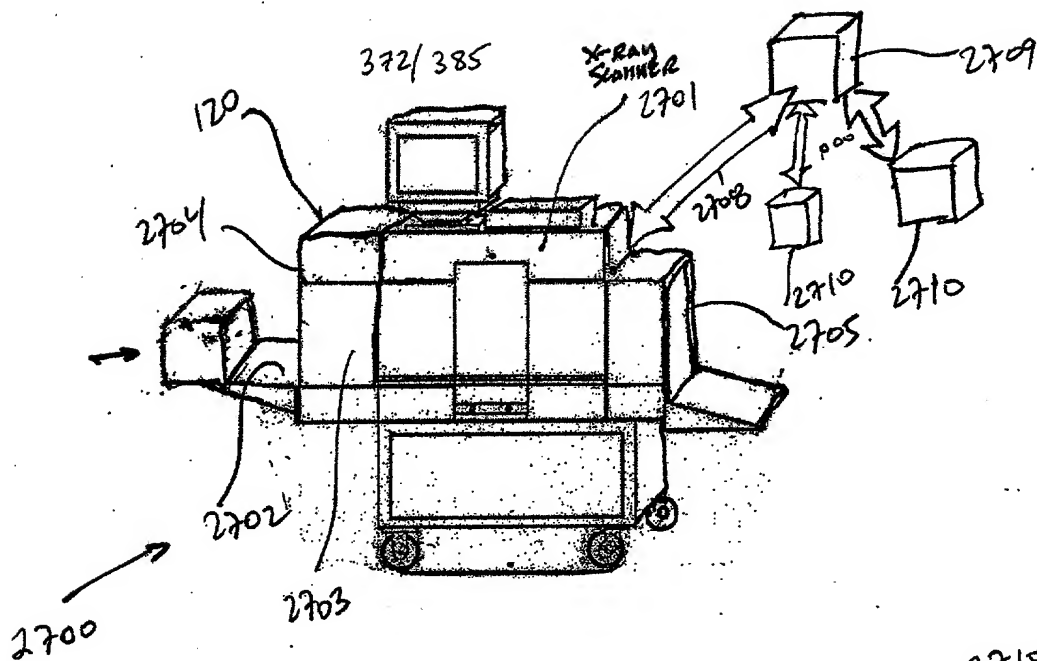


FIG. 69B3



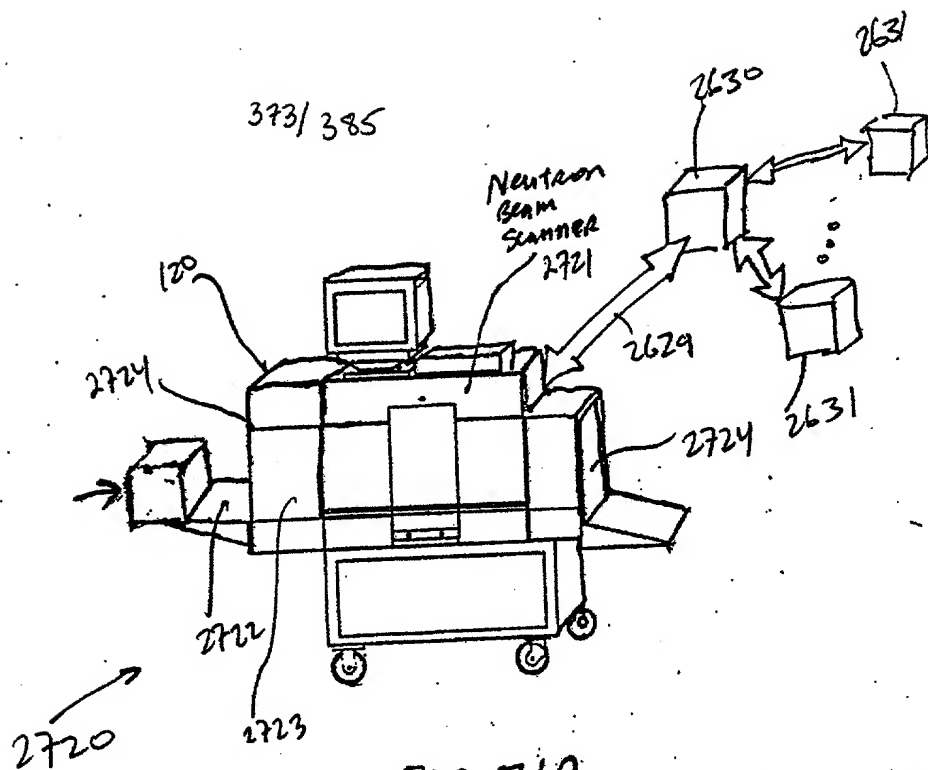


FIG 71A

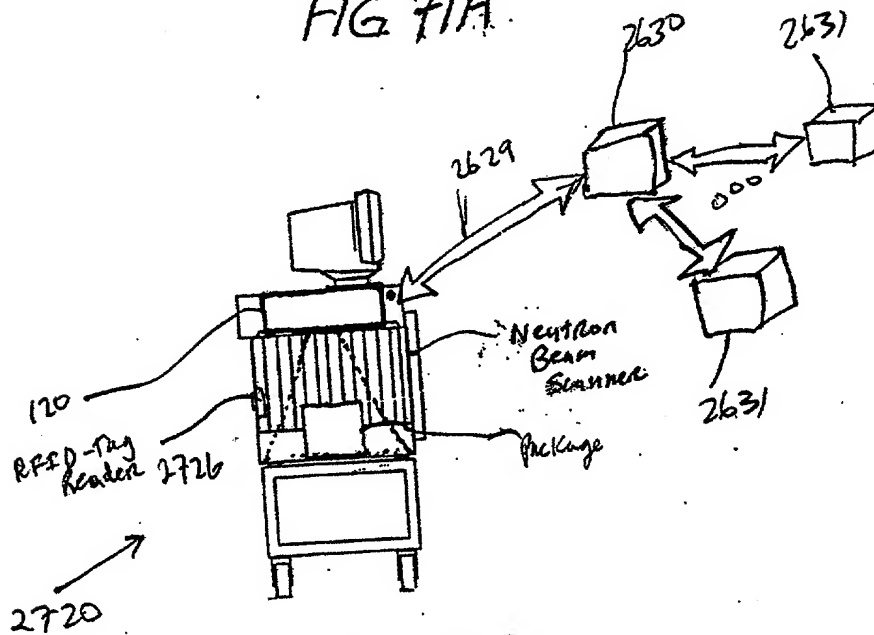


FIG 71B

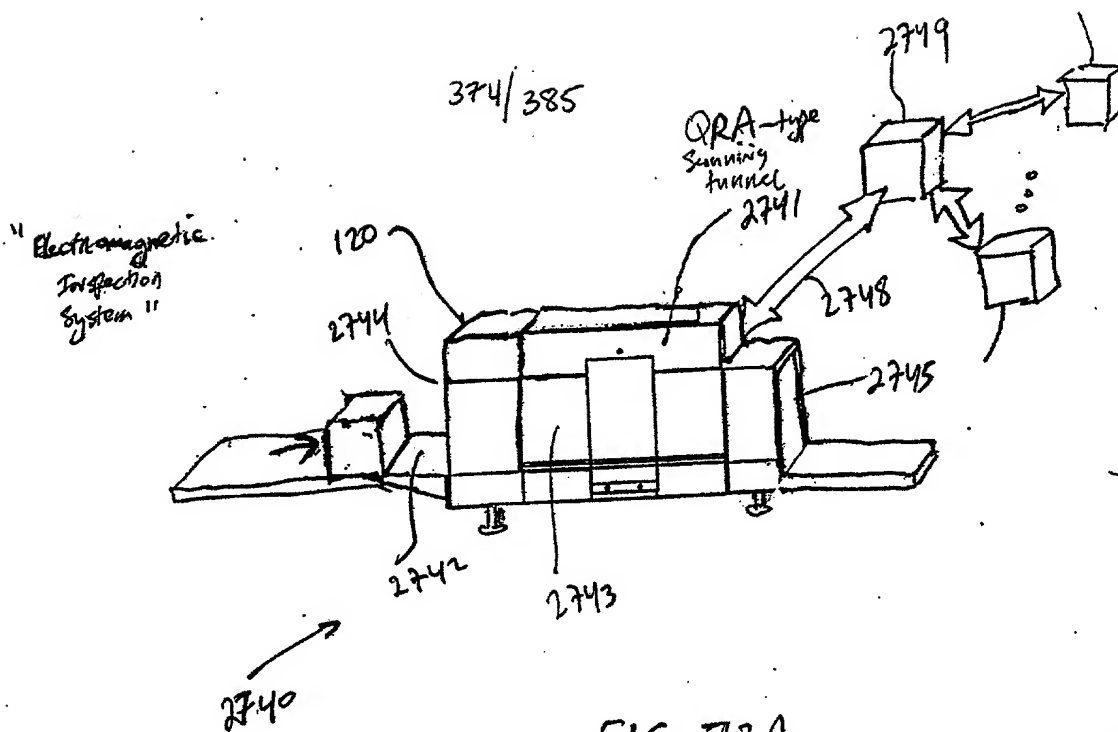


FIG 72A

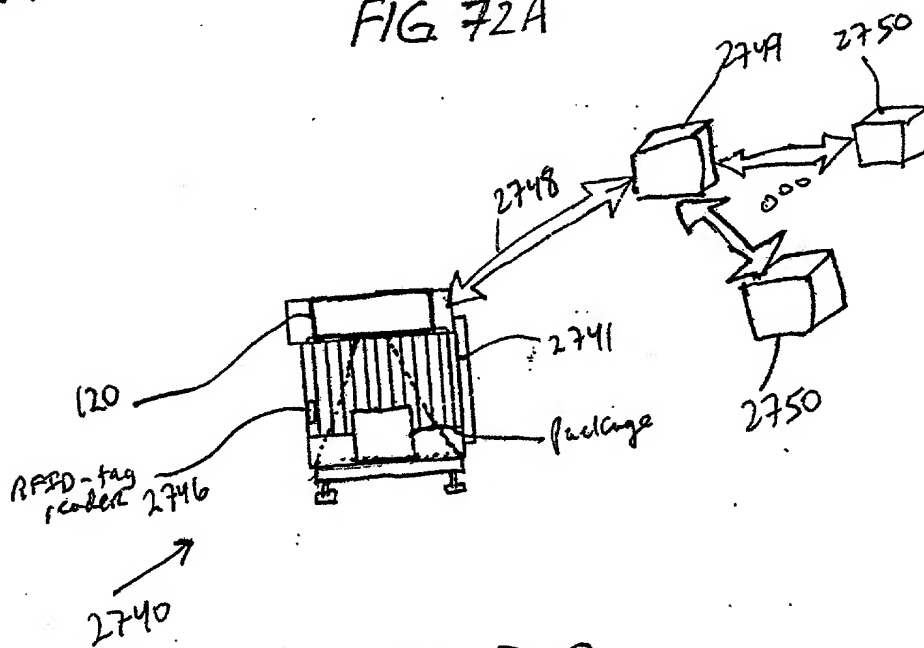
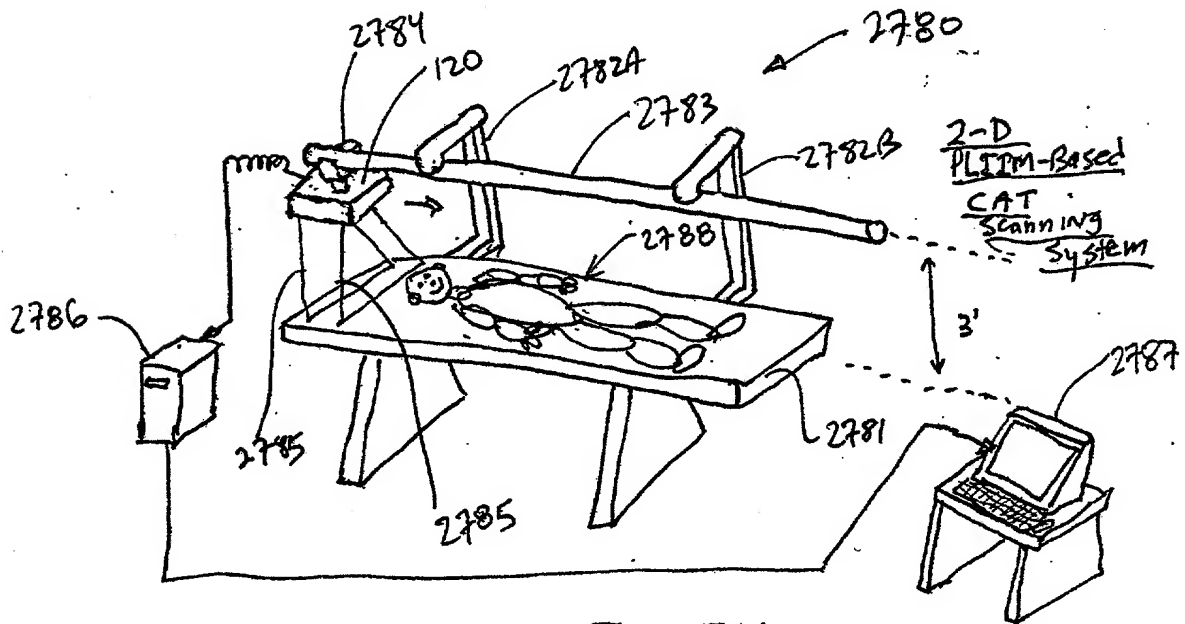
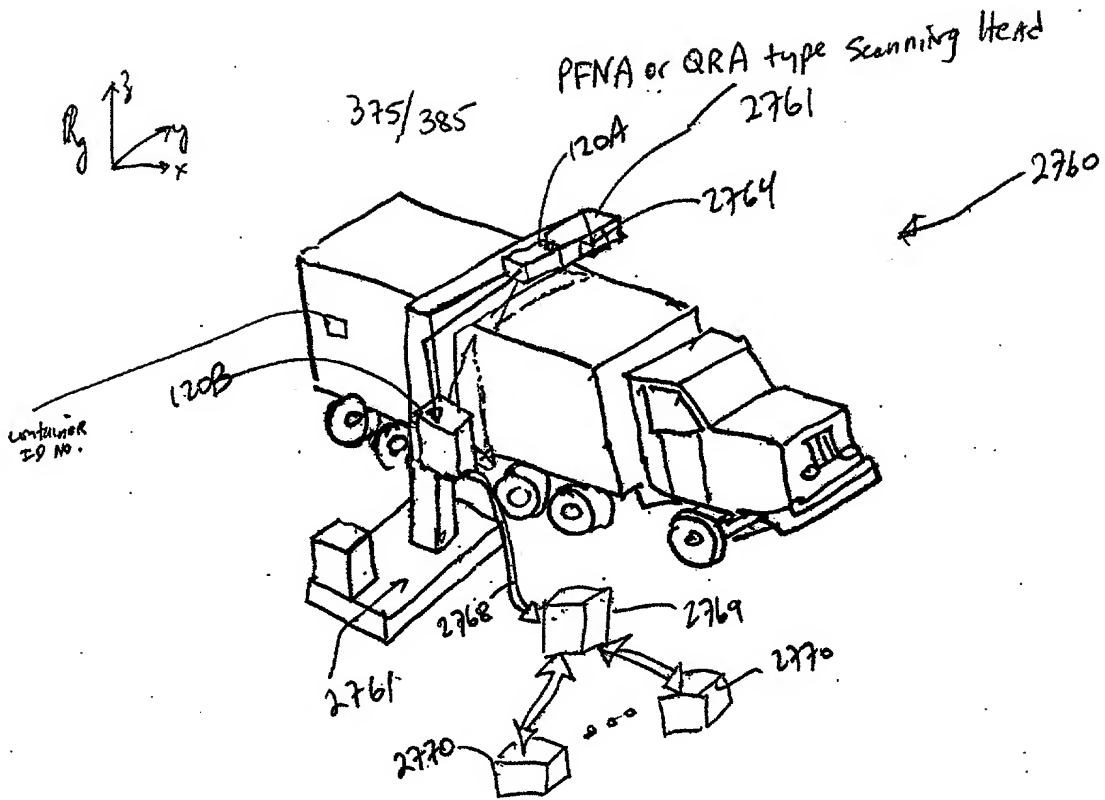
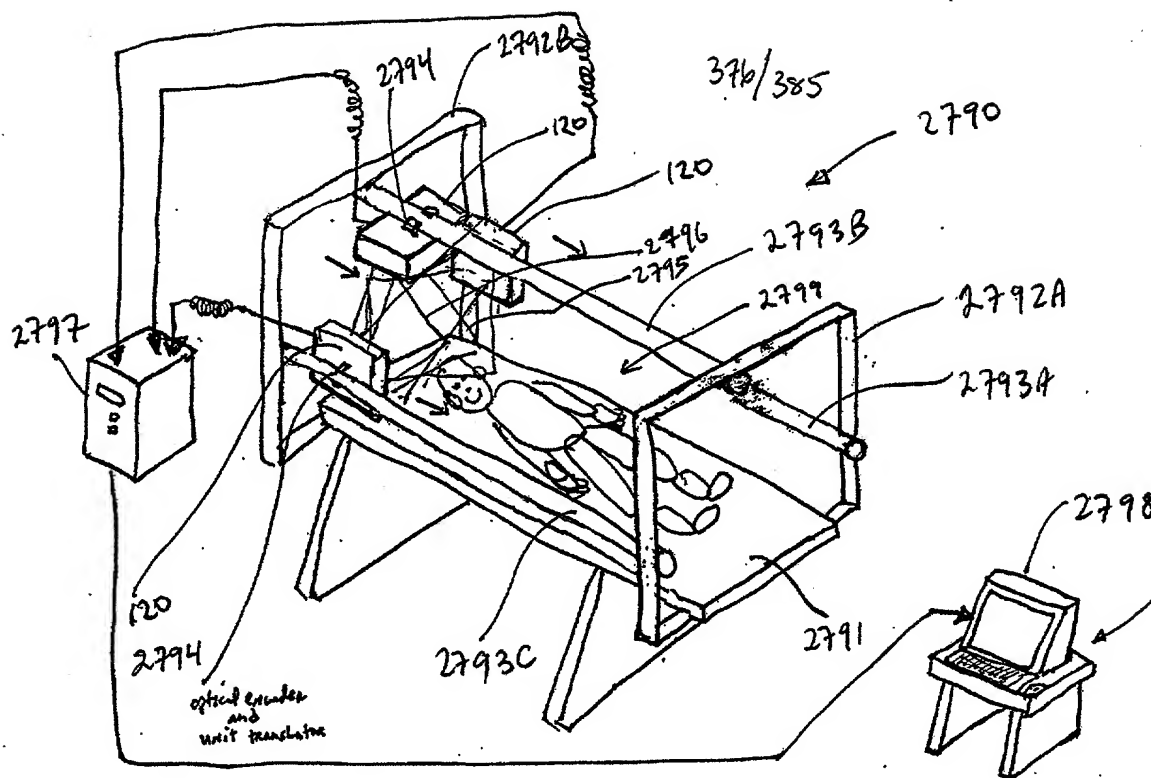


FIG 72B



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3-D PLIM-Based  
CAT Medical scanning  
System

FIG. 75

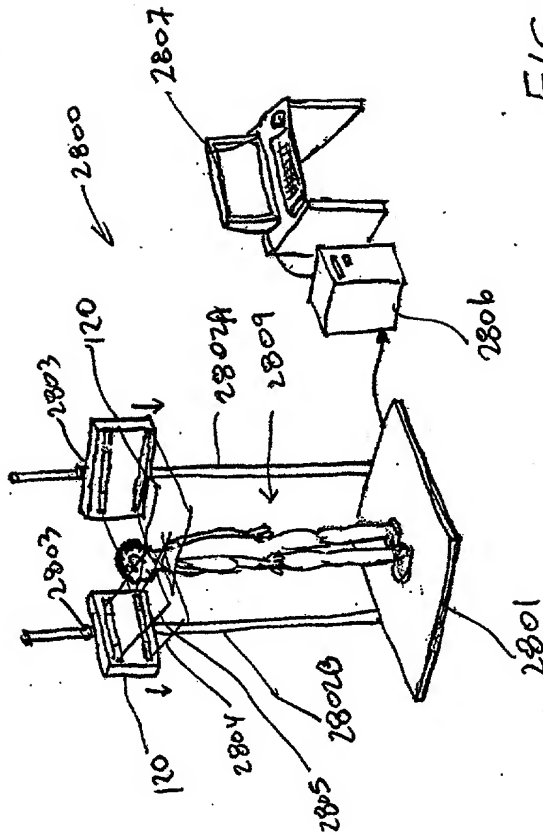


FIG. 76

377/385

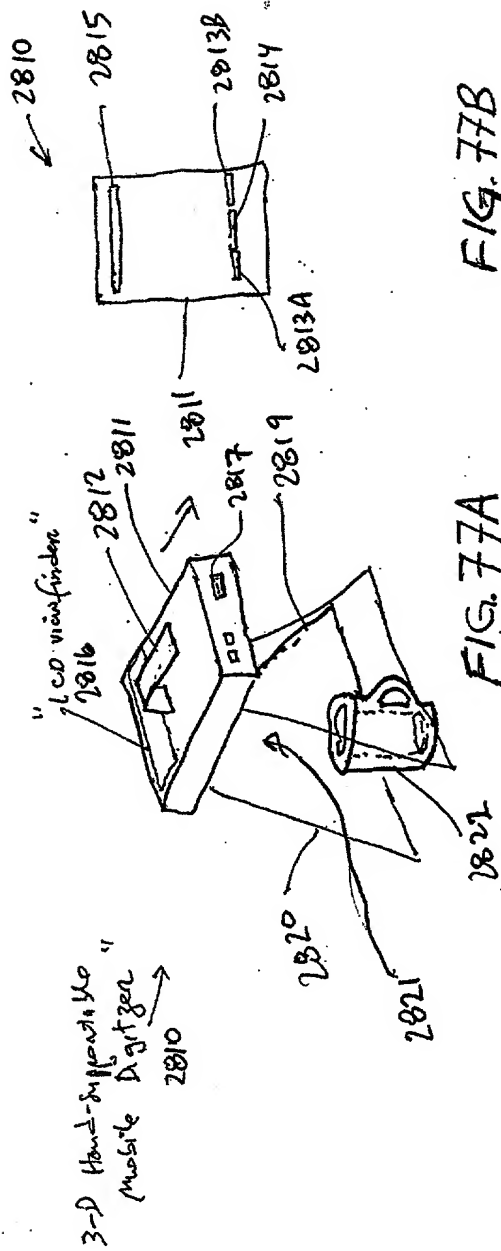
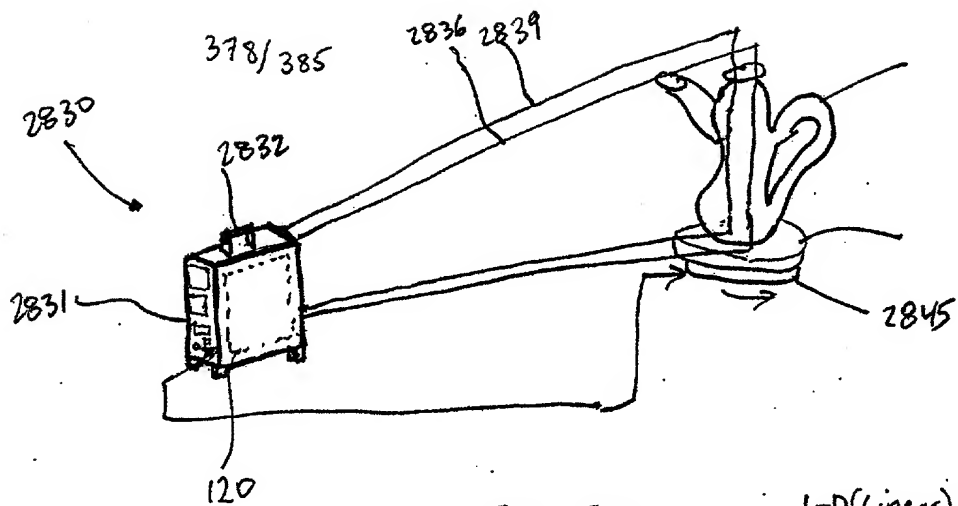
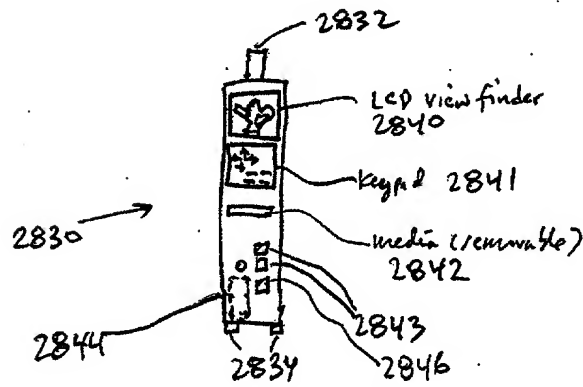
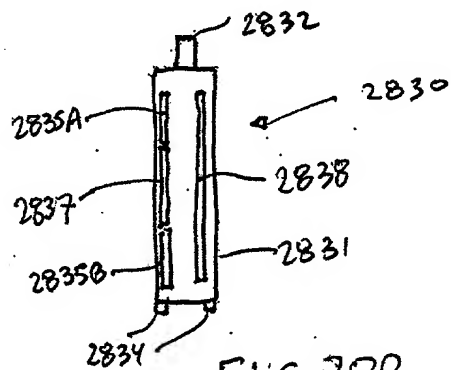


FIG. 77A

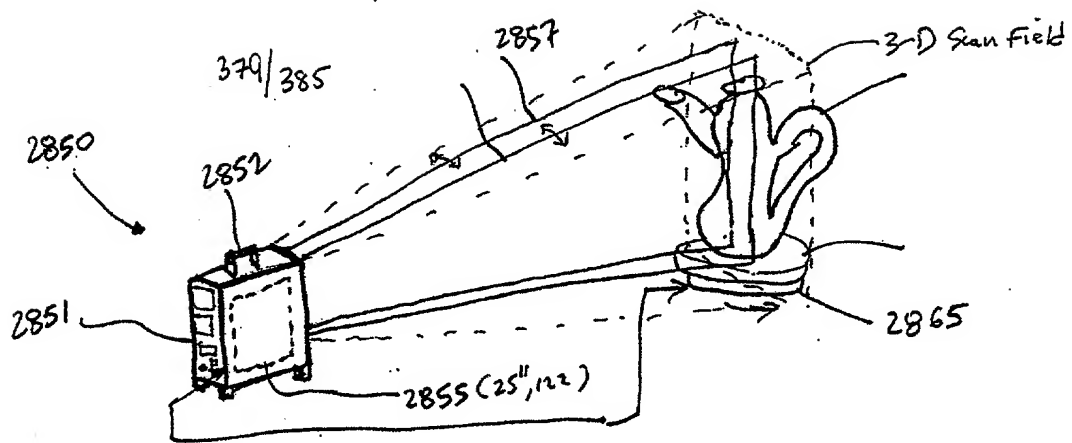
FIG. 77B



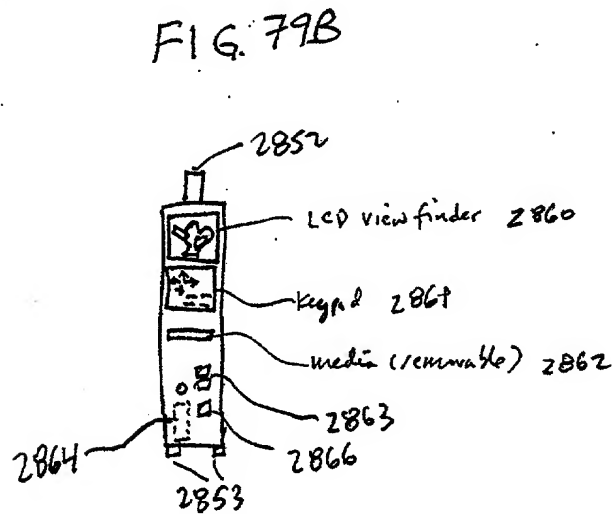
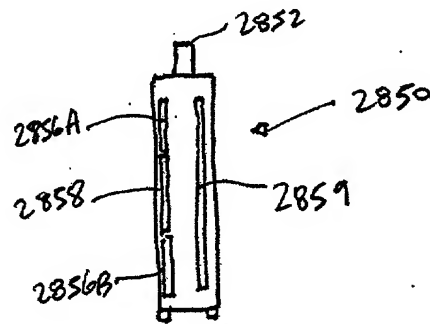
1-D (Linear) sensor







3-D (Area) sensor



Automatic Vehicle Identification (AVI)  
System of present invention

\* employing overhead profiling  
and imaging sharing  
license plate image capture

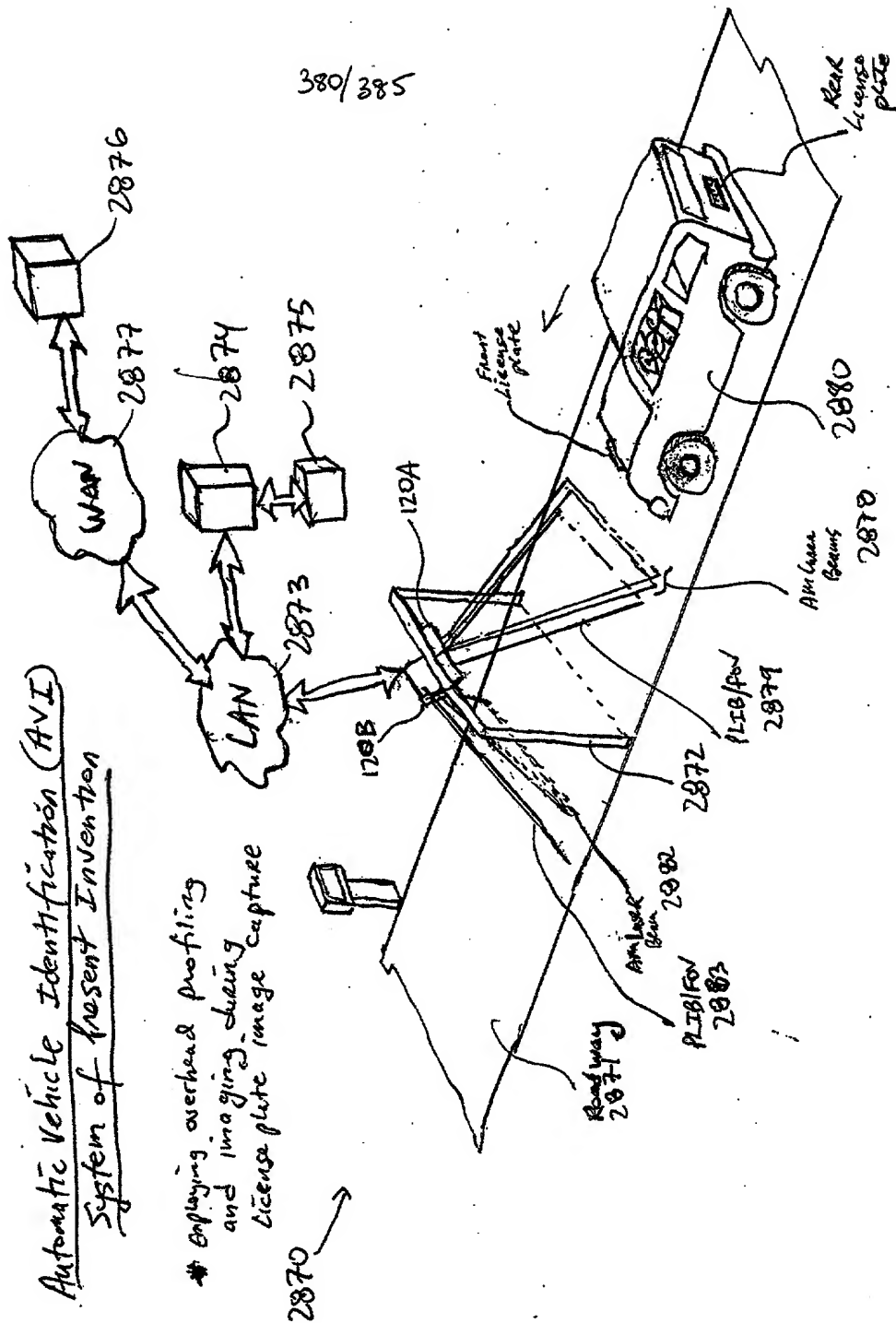


FIG. 80

Automatic Vehicle Identification (AVI)  
System of Present Invention

\* Employing overhead profiling  
and imaging techniques during  
license plate image capture

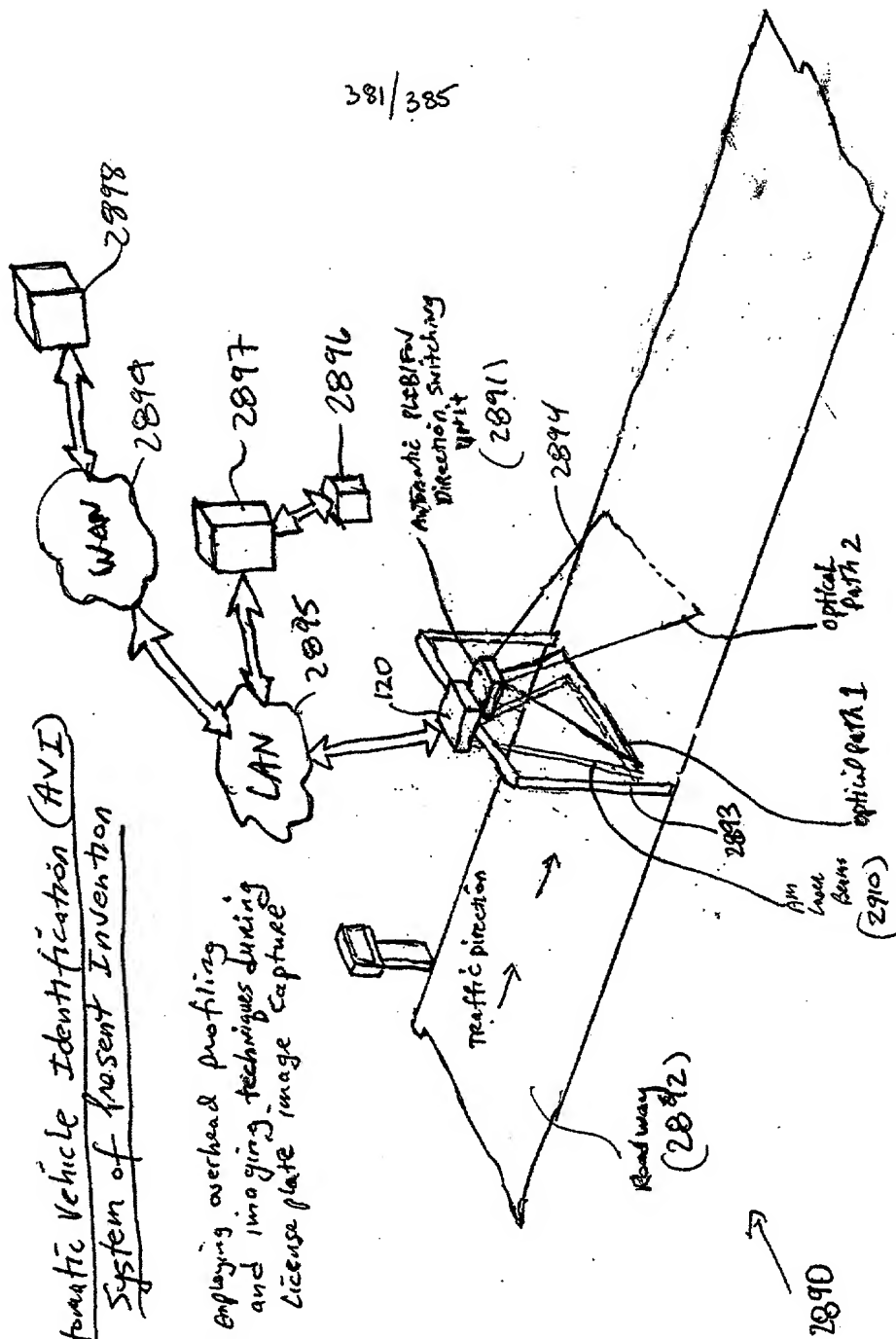


FIG. 81A

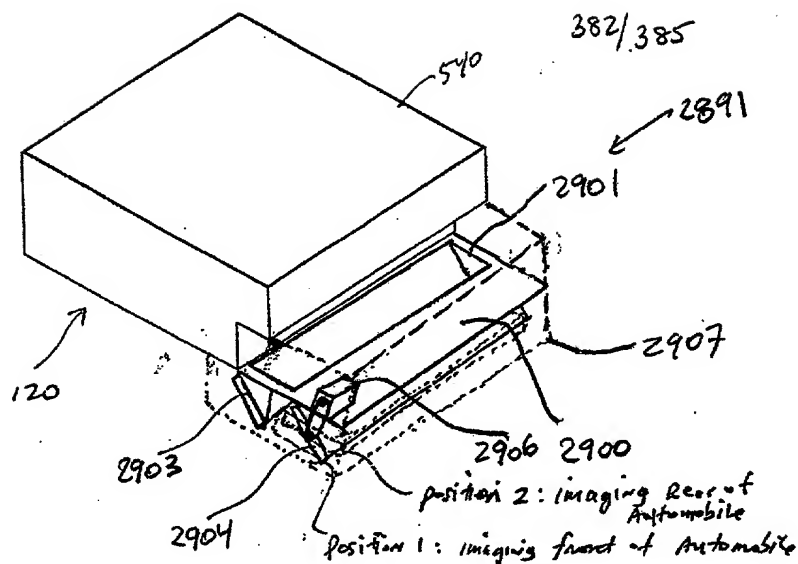


FIG. 81B

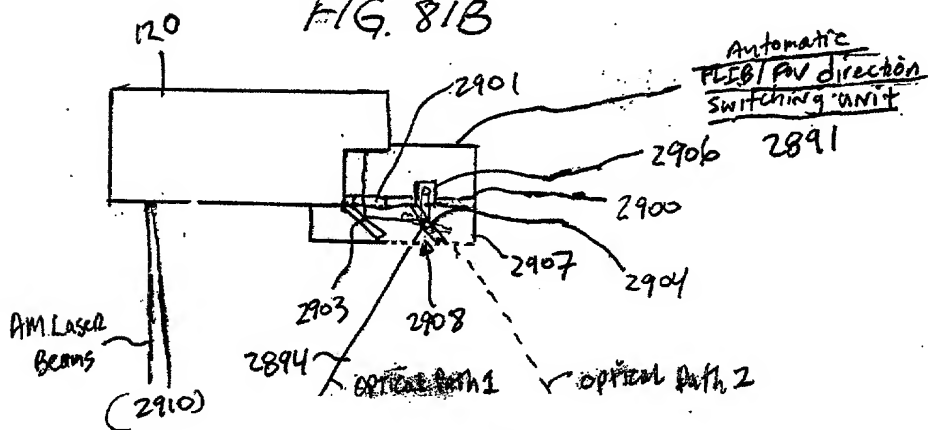


FIG. 81C

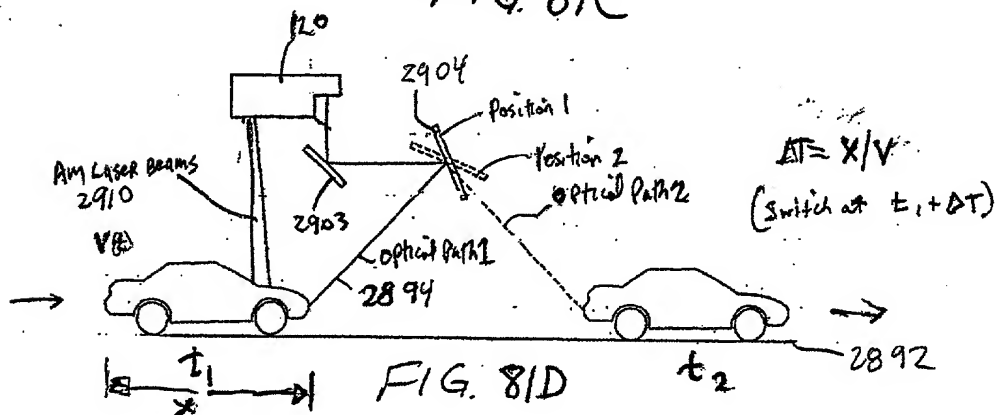


FIG. 81D



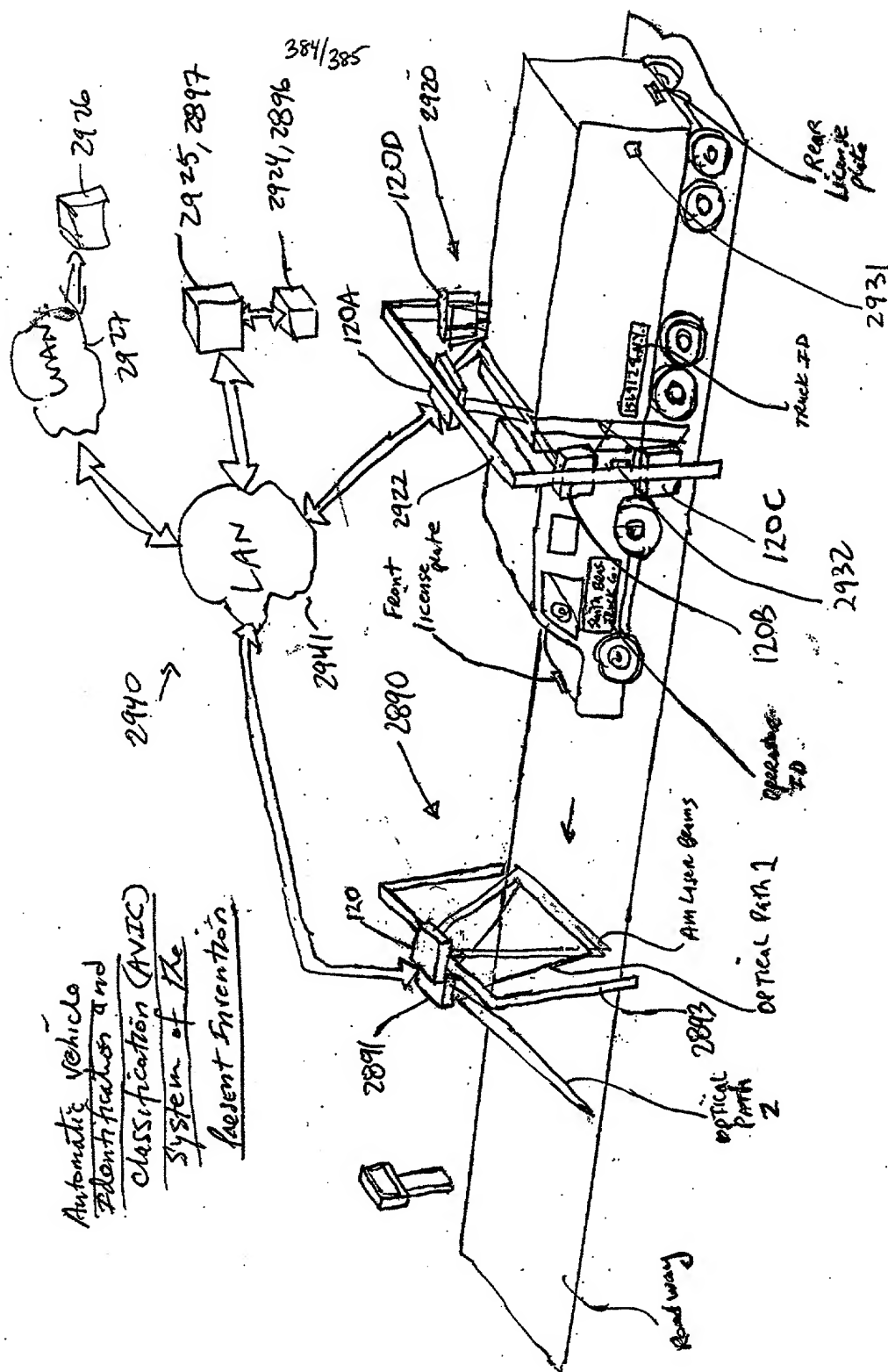


FIG. 83

